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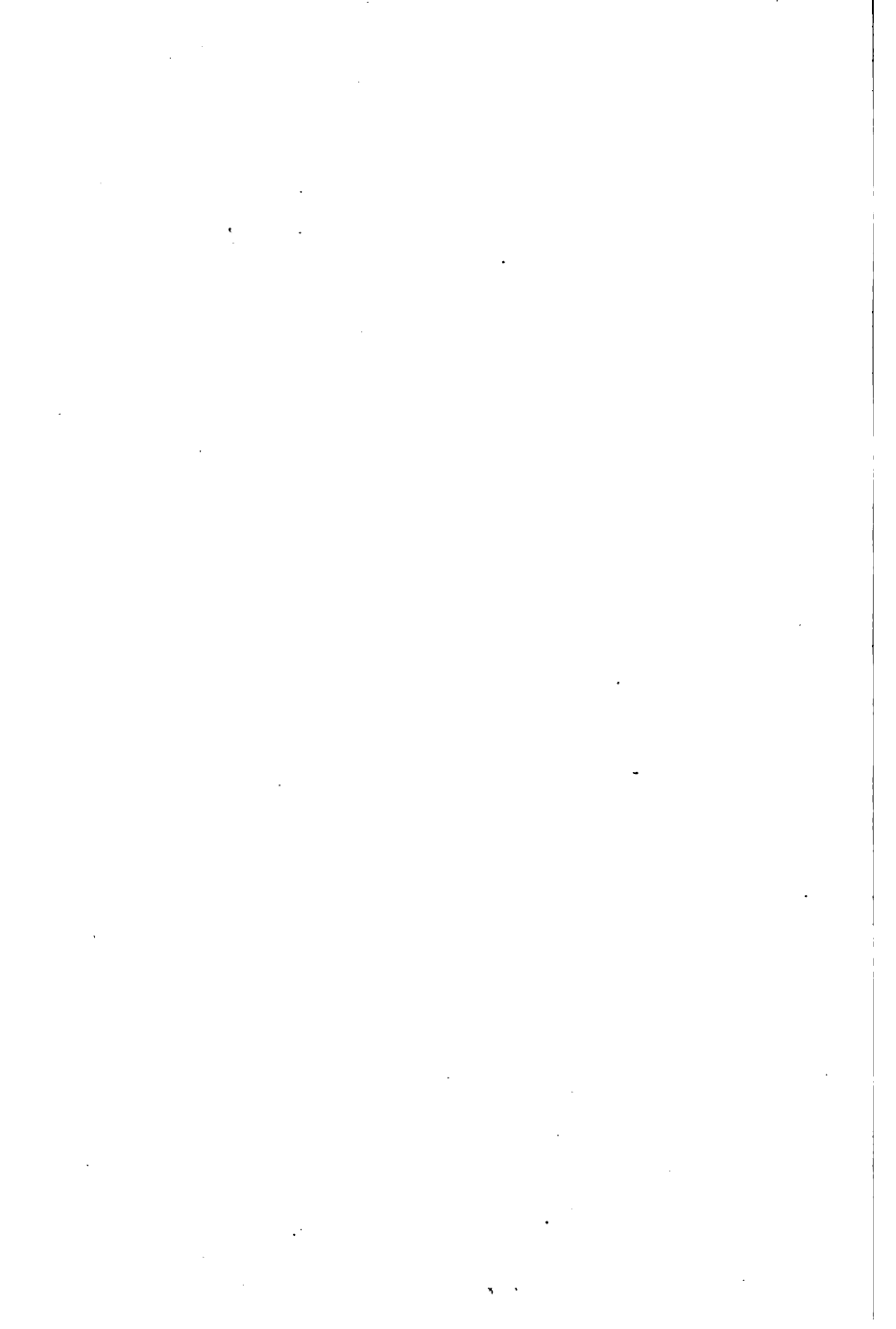
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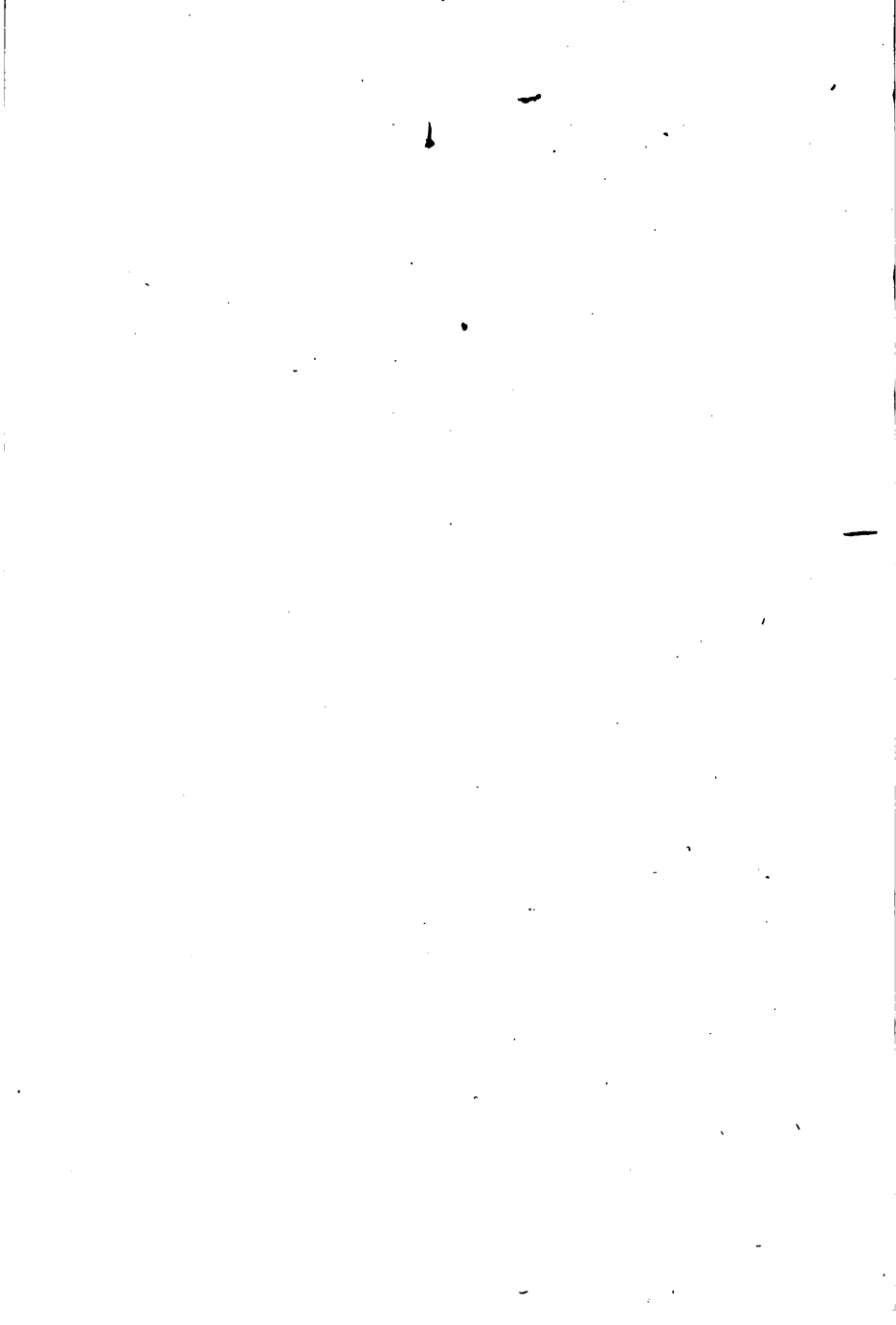


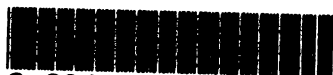
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**THE  
STORY OF THE EARTH**





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**PLATE 1. THE FIGHT WITH THE CAVE BEAR**

From a painting by Charles Knight

See page 98.



# THE STORY OF THE EARTH

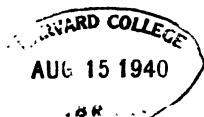
BY  
CARLETON W. WASHBURN  
AND  
HELUIZ CHANDLER WASHBURN

*ILLUSTRATED*



NEW YORK  
THE CENTURY CO.  
1916

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Sheldon T. ...

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## PREFACE

General science is a real need in our elementary schools. Our pupils can no longer be generally intelligent without at least a qualitative idea of the fundamental sciences. Our motion pictures, our magazines, our newspapers (including their comic sections), and our books, all make it evident that science has come forth from the cloisters of the higher institutions of learning to sit at the hearth of commonly intelligent humanity.

Not to know now-a-days that coal is of vegetable origin, for instance, is to plead as guilty of ignorance as not to know that Cæsar was a Roman, or that Pekin is in China. None of these three facts is essential to life. But all are essential to that general intelligence without which there is little culture, little ability to appreciate literature or the fellowship of intelligent people.

It is true that under a similar pretext school-

men have tried to force a large body of useless knowledge on suffering children: the exact dates of battles, the boundaries of states, dead languages. But certainly a general qualitative idea of science is not a demand emanating from the schools. For we have not taught much science of any kind to our children and what we have taught has been of a very different nature from that indicated by the demands of common knowledge.

The science of our schools is, in a word, quantitative. That is, it concerns itself with exact measurements, accurate data, rigorous experiments, and demonstrations of laws which have to do with quantitative relationships. Hours are spent, for instance, in some of our high school laboratories, in the exact determination with a vernier caliper of the coefficient of expansion of aluminum. Such experiments are liable to be tedious, require much time, and thereby greatly limit the scope of the sciences taught. They are, moreover, entirely out of the reach of our elementary schools.

But an intelligent life demands no such quantitative knowledge. Such a general fact as that things become larger when heated is all that most people want. Yet they want a wider scope of knowledge than our schools can possibly give them when we present each science quantitatively. For people have found themselves absorbed by the varied discoveries of modern science, and desire a rudimentary knowledge which will allow a comprehension of these discoveries when announced in newspaper, magazine, novel or motion picture. In a word, common knowledge demands a science which is general and qualitative.

Most children leave school before they reach high school. So if we are to equip them with this qualitative general science it must be done in our elementary schools.

Consequently many schools are beginning to introduce elementary courses in general science. The San Francisco State Normal School is among these. But when we planned our work here we found an appalling lack of

suitable literature. The older nature studies did not cover nearly as wide a scope as we wished; the books on general science were for the most part either technical or condescending. Fortunately there were such writers as Dr. Holden and Miss Jennie Mix. But we needed more; so it soon became incumbent upon us to prepare our own material.

This was done at first in outline form and the stories were told by our student-teachers to the children in our elementary school and in some of the San Francisco city schools. As we watched the children's response the stories were changed and adapted. Finally we wrote them out in full, trying to keep the colloquial form in which they were told.

Throughout these stories and all of our science work our aim is to give in a dramatic and interesting form those qualitative untechnical parts of general science which the twentieth century standard of intelligent humanity demands.

. . . . .

In acknowledging help and courtesies in the preparation of this book, our greatest indebtedness is, of course, to Dr. Burk, President of the San Francisco State Normal School. His suggestions and criticisms have been invaluable. Mrs. Lucy A. Smith and the students who first told these stories have also been most helpful.

The sources of the half tone reproductions of photographs and reconstructions are acknowledged on each plate. Six of the line drawings are taken directly from other books by permission of the publishers, and acknowledgment is made in each case in the list of illustrations.

The rest of the line drawings are by Heluiz Chandler Washburne. But in the case of extinct animals they are based on the work of acknowledged authorities—for the most part on paintings and reconstructions in the American Museum of Natural History. In this connection we wish to express our hearty thanks to Dr. Frederic A. Lucas, director of this museum, for his courtesy in allowing us to use

these and the material in his "Animals of the Past." We also wish to thank Miss Jennie Irene Mix and the American Book Company for permission to base the drawing of some of the pterodactyls on an illustration in "Mighty Animals."

The principal books consulted in the preparation of these stories are: Chamberlin and Salisbury's "Geology History"; Lucas's "Animals of the Past"; Mix's "Mighty Animals"; Waterloo's "Story of Ab"; Jordan and Kellogg's "Animal Life"; Allen's "Story of the Plants"; Hutchinson's "Extinct Monsters"; Lancaster's "Extinct Animals"; Osborn's "Age of Mammals."

CARLETON W. WASHBURNE,  
HELUIZ CHANDLER WASHBURNE.

San Francisco,  
January 22, 1916.



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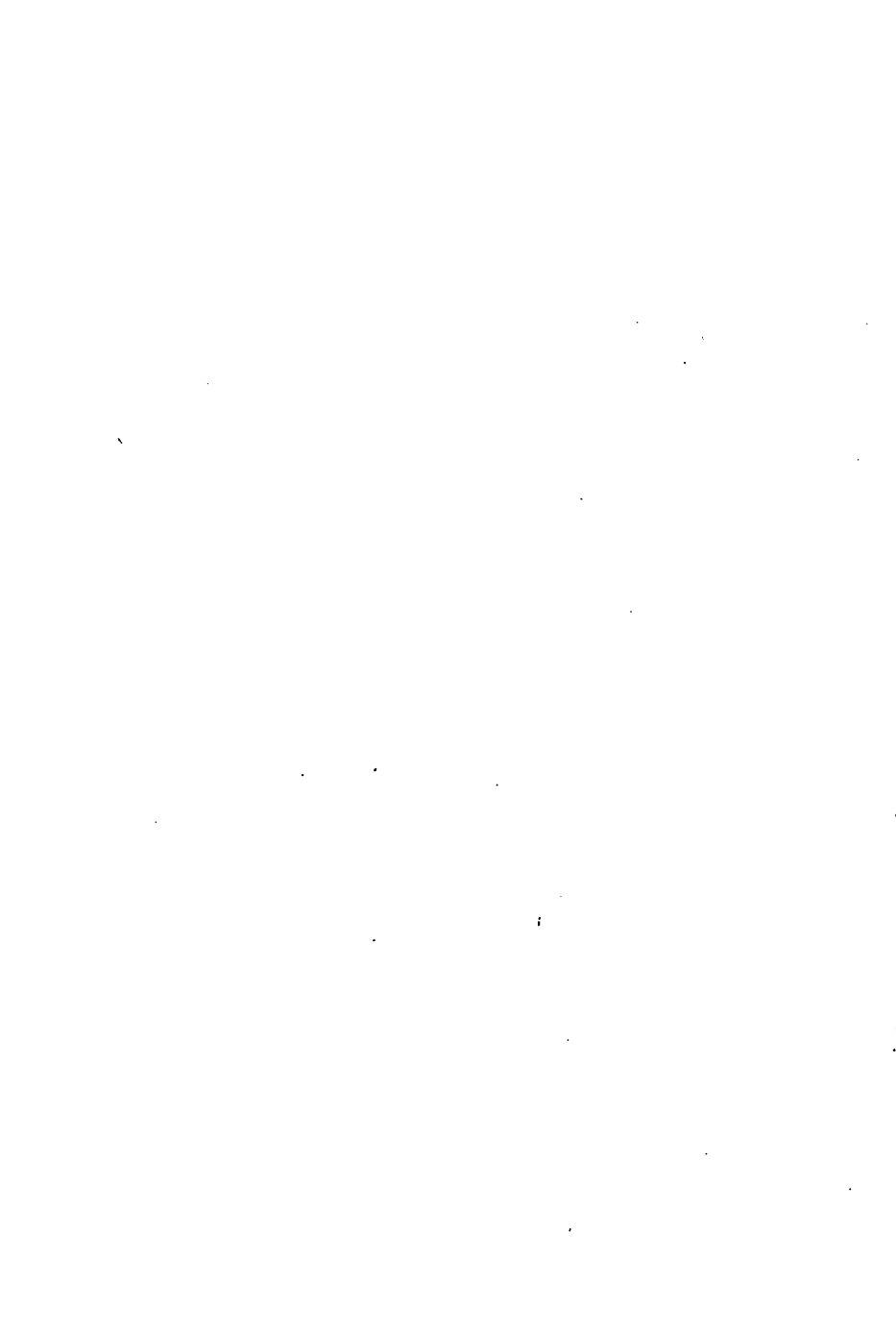
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**THE  
STORY OF THE EARTH**





# THE STORY OF THE EARTH

## CHAPTER I

### HOW THE EARTH GOT HERE

**L**ET'S pretend that we are living several hundred million years ago and have bodies that can live in fire, and eyes that can see the stars through the blaze of sunlight.

We can't be on the earth, because this is in the days long, long before there is any earth. So we'll ride through space on the sun—an enormous ball of fire a million times as big as our earth will be when it gets here.

As we whiz along several hundred miles a minute we see that there are stars all over the sky, trillions of miles away. And as we watch these stars, we notice that one of them seems bigger than any of the rest.

As the thousands of years go by—only there

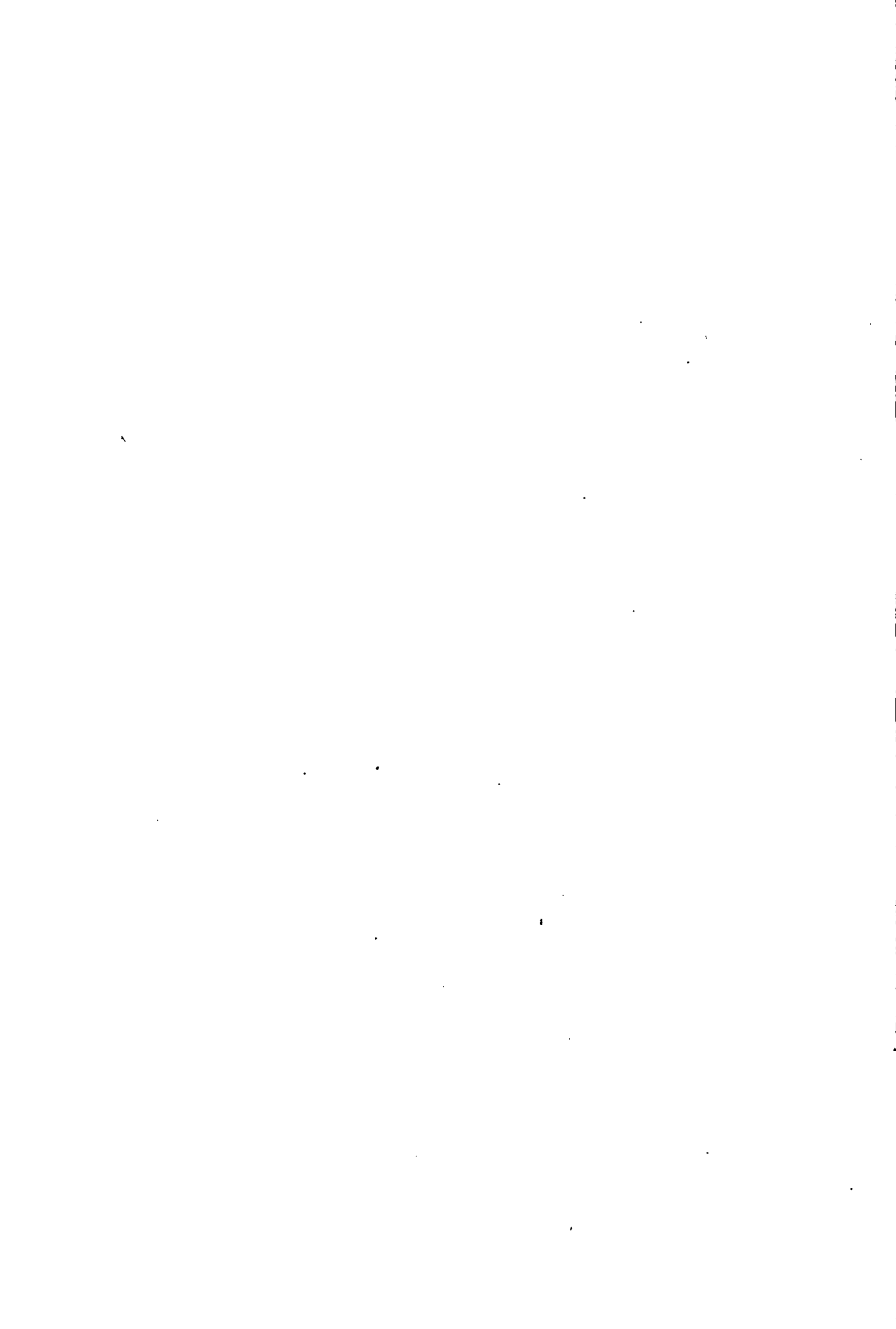




PLATE 2. THE GREAT SPIRAL NEBULA  
From a photograph. Courtesy of Lick Observatory.  
Mt. Hamilton, Calif.



for every minute it comes hundreds of miles closer. But luckily, it speeds on past us without touching the sun.

Yet when it is closest its pull is so terrific that it tears our sun to shreds and yanks us out into space with a cloud of the glowing gases. For a moment it seems almost as if we and the rest of the sun-stuff are going to rush right after the fleeing star. But we have been going so fast in the other direction that even the star's mighty pull cannot check us and draw us after it; so we are left in the midst of a vast cloud of shining dust, and gas, and white hot rocks, whirling on through the sky, as the star dims in the distance.

This whirling, gleaming cloud, billions of miles across, is all there is left of our sun. It is called a nebula.

. . . . .

If you want to know what this nebula looked like then, look at Plate 2. This is a photograph of another nebula—the Great Spiral Nebula which can be seen from the earth tonight through telescopes. There are thousands of others like it which the astronomers

## 8 THE STORY OF THE EARTH

have discovered. This nebula, too, may have been a sun once, long after our nebula was formed. And it, too, may have been made by the terrific pull of a great star rushing past it, just as our nebula was made. So if some one had looked from a star at our nebula, ages and ages ago, it probably would have looked very much like this photograph.

. . . . .  
To go back— As we float through the nebula we notice that we are in a shining sort of fog with brighter star-like things moving through it. But the most surprising thing is this—we have n't any idea whether we are right side up or upside down! If we push each other gently we go floating apart for a mile or two, and then, if we have n't pushed too hard, we come floating back together, slowly at first, then faster as we come nearer, until we gently but firmly bump into each other.

For we, and every piece of rock, or cloud of gas, in all the nebula, are like magnets, and pull on each other. So, as we look around in the hazy light, it is not long before we see one of the star-like things being pulled toward us

while we float over toward it. Then we discover that it is a blazing white-hot rock, and that it is *down*—for the first time we know what “down” means: it is just toward the thing that is pulling us the hardest.

Soon we see that the glowing rock as it rushes along is pulling all the small particles near it into itself as well as pulling us. Finally we fall right on to it and go riding through the nebula on its white hot back.

If we get tired of this hot and fast-growing chariot, or of being pelted by the thousands of hot grains of dust or melted pebbles that it keeps pulling toward itself, it is easy enough to jump off. One short jump sends us several miles high. But we whiz right along just as fast as the rock and slowly float back toward it again. We land with nary a jolt on this uncomfortable rock which has now grown so big that it pulls twice as many missiles out of the nebula onto our heads.

It's lucky for us that little matters like blazing rocks don't affect us, and that we can live through millions of years; for if we could n't, we'd not know much about what was happen-

## 10 THE STORY OF THE EARTH

ing. But as time and time goes on our rock grows bigger and bigger. No sooner does it get a chance to cool a little than new rocks falling into it heat it up again by the violent rub they give it. And it grows and grows and grows until it becomes a great ball two or three thousand miles thick and gleaming white hot. It is our Earth! It is not yet half grown and looks more like a small sun than anything else, but it is the very same earth that people will live on in a few hundred million years.

But as we look into what is left of the nebula—it is pretty well thinned out by now—we see far in the distance another great ball of shining hot stuff, much, much bigger than the one we are on, but made just as ours was made—by the gathering together of millions of particles out of the nebula.\* And that huge ball of fire is our sun.

Between us and the sun there are two smaller balls of glowing rocks, the beginnings of the planets Mercury and Venus. And out beyond us are five more—these are to become the five other planets: Mars, Jupiter, Saturn, Uranus, and Neptune. And all eight of the planets, in-



## HOW THE EARTH GOT HERE 11

cluding our earth, are already circling around the far greater *sun* in the center. And all eight have continued to whirl about it ever since, for its pull is so great that they cannot get away, and the planets are moving so fast that it cannot pull them closer.

Now that our earth is getting so big, it begins to be able to pull the lighter gases and steam and particles of air from the space it circles through. With these it surrounds itself until it has an atmosphere and clouds. The clouds grow denser and denser until they shut out our view of the sun and the other planets; so all that we can see in the sky is a vast shimmering bank of clouds reflecting back the gleam of the white hot young earth.

As to the moon, it may have been formed just like the earth—from the nebula. And as it rushed past the earth, the earth's pull (or gravity) may have partly stopped it and kept it swinging in circles around and around the earth forever, just as the earth and the rest of the planets swing around the sun.

. . . . .

This story is based on the scientific theory

## 12 THE STORY OF THE EARTH

of a geologist and an astronomer now living (Chamberlin and Moulton) and is probably mostly true. There have been many other guesses by great scientists, and one or two are almost as likely as this one. But practically all agree that the sun and our earth and the other planets were once a part of a great nebula like the nebulas we can see in the sky any night.

## CHAPTER II

### HOW THE EARTH CHANGED

**Y**OU remember that after the earth was formed from the nebula it was very, very hot—so hot that it shone almost as brightly as the sun. It was so terribly hot that even the steam which it had gathered from the nebula could n't come near it but floated high above it on all sides, near the coldness of outer space. Here it was cooled into great clouds—such great masses of thick clouds that the sun could not shine through them. And these thick clouds hung all around the earth for thousands and thousands of years, so that earth and sun never saw each other.

Yet it was far from dark on the earth. For the white hot earth gave out a light too dazzling for any eyes to stand, and the high clouds reflected the glare back to the earth again. There was no day or night, winter or summer.

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All the time as the earth spun 'round, its light was more brilliant than our brightest days. All the year the heat was terrific—like a fiery furnace winter and summer. And it remained like this for ages.

Little by little the great heat of the earth radiated out into space and the earth became a little cooler on the outside. The intense white heat slowly faded to a brilliant orange yellow. And the high clouds reflected back the yellow light and made a sky that looked like burnished gold in every direction, for years and years and years.

After a long, long time, as more heat left the earth and it cooled a little more, it turned from orange to scarlet, from scarlet to red. Now the great clouds must have shone like a sky full of gleaming rubies and reflected the red light back to the red-hot earth.

But slowly, year after year, century after century, the earth lost more and more of its heat, and cooled and cooled. The shining red must have dulled and the dull red purpled, until the glow ceased and the whole earth was plunged into black night.

There could be no day at all now for our sun could not yet send his rays through the thick clouds that still hung high above the earth on all sides. And our earth was no longer hot enough to glow of itself. So all must have been inky black for thousands of centuries.

And still the earth was cooling gradually.

As it cooled the clouds probably gathered closer to it—they did not have to be so high now to form from the steam the earth held around itself.

Suddenly a great crack opened in the black earth and glowing melted rock gushed forth, lighting the whole sky with a lurid glare. The whole earth shook and trembled, and parts heaved hot dust and melted metals high into the air.

Then slowly this cooled and the earth darkened once more into its continuous night. And the clouds lowered a little. And tiny droplets of water gathered about the particles of dust that had been upheaved. And a few drops of rain formed and began to fall. But they had

## 16 THE STORY OF THE EARTH

not fallen half way to the earth when its heat changed them into puffs of steam, and they floated back to the clouds.

And still the earth was cooling.

The outer part cooled faster than the inside of the earth, and shrunk as all things do when they cool. Then as it shrunk it would become too small for the great hot inside, and would crack again, pressing out the rocks from the inside in glaring red rivers of melted granite. These would light the long night, the clouds sending back the red glow once more. And again the earth would darken and cool.

And then the rain began to fall. It came faster and faster, sizzling off the hot rocks like water off a hot stove, filling the air with steam, and pouring down in torrent after torrent through the inky steam which boiled off the hot black earth. Now even the gleam of volcanoes would light up but little of the sky. And the drenching hot rain poured and poured.

As the earth cooled little by little, some of the hot rain stayed on it, forming boiling pools. Then these overflowed into each other and formed lakes; and the boiling hot lakes over-

flowed and formed steaming oceans; and the oceans overflowed and joined, until the whole of the earth was covered with a mighty, dark, seething sea. The ocean water steamed and frothed as it was lashed by the fierce hot winds. And through the darkness hot rain still streamed down.

In the midst of the sea bottom great earthquakes shook the hot water; volcanoes burst through the water, sending sizzling hot rocks up through it into the black, steam-filled air. And the bottom of the ocean writhed and twisted, trying to throw the hot water off of itself and to reach the air again.

Little by little as the water poured from the skies, the clouds grew thinner and a dull gray light spread over that part of the earth which was turned toward the sun. And the day could be told from the night. To be sure, the day was scarcely lighter than our night, and the night knew no stars and no moon, for their dim rays could not shine through the thick clouds. But little by little as the rain left them, the clouds thinned, and more and more light sifted down to the warm and frothing sea.

## 18 THE STORY OF THE EARTH

After thousands of rains, while the storms raged over the world-wide ocean, and the sea bottom of solid rock cooled and warped, and the world shook with earthquakes and volcanoes under the sea, the clouds grew thinner and thinner; the days became lighter, and even the light of the full moon came faintly through the clouds by night.

Then one day there came a mighty storm, and streaming torrents of rain fell. As the storm cleared, the wind blew apart some of the clouds that had hung over all the earth from the earliest time. And for a few minutes the sun shone full on the face of the turbulent sea. There must have been radiant colors in the sky that day, more gorgeous than our most wonderful sunsets. Perhaps there were rainbows from the myriad drops of moisture in the air. And the universal ocean greeted the sun with a thousand shining colors as it heaved and glinted beneath the sun-washed sky.

And still the earth was cooling. The ocean grew less hot. The sun shone more often. The rain only poured part of the time.

Then the warping ocean bottom in a final



struggle pushed up in places, rolling the waters off of it, and standing free to the light of the sun. This formed islands. More of the ocean bottom heaved up, and great continents were formed. But the waters of the deep ocean rushed angrily at the sides of the continents and islands, trying to pull them back beneath the water.

And the waves succeeded somewhat. Pounding day and night on the rocks, sending water into the air as clouds and pouring down as rain, the waves wore and carved the rocks. Great chunks were knocked off by the waves, then hurled against the rocky shores and ground to bits. In this way the first sand and gravel were formed.

The waves threw the sand high onto the shore. The running waters from the rains ground the valleys into more sand, and washed this down to the bottom of the sea. After thousands and thousands of years, the ocean bottom was covered with the sand and gravel washed from the islands and continents. Then this ocean bottom pushed up and rolled its waters off onto what had been land, and the

## 20 THE STORY OF THE EARTH

old land sank, leaving new rugged mountains covered with the sand and gravel washed from the first land.

And again the waters went at their ceaseless work—trying to wear down the land and carry it back beneath the ocean depths from which it rose. But just as the water would get some parts leveled off, volcanoes would pour their glowing rivers of melted rock out on the surface of the land, new mountains would rise from the still cooling earth, and again the waters would have to work—ceaselessly and patiently and powerfully, carving the valleys, washing the shores, and smoothing the face of the rugged land.

So little by little the earth came to look as it now looks—with oceans and continents, mountains and rivers, lakes, valleys, occasional volcanoes and deserts, cliffs and sandy beaches.

But nowhere, as far as eye could see, was there one sign of life. Had you looked at the world then it would have seemed utterly dead. No birds sang, no insects droned, no trees cast their shade on the white sands. Not a fish glided through the water, not an animal

prowled; not even a worm crawled through the ground. In all the sea there was not a seaweed. On all the land there was not a flower—not even a blade of grass.

Everywhere was land and water and sky, all empty. And all that could be heard on this whole great earth was the blowing of the wind and the ceaseless lapping of the waves against the lonesome beaches.

## CHAPTER III

### HOW THE EARTH CAME ALIVE

**M**ILLIONS of years ago, if we could have visited our earth, we would have seen mountains and valleys, rivers and lakes and oceans; we would have seen the blue sky and clouds and would have felt winds very much as we do now. But the whole big earth would have seemed utterly lifeless and dead. No leaves or flowers or grasses grew on the land, no birds or insects flew through the air, no fishes swam about among the seaweed—for there were neither fish nor seaweed. Our whole great mother earth was sound asleep.

And when she began to wake, she woke so slowly and silently that we would never have noticed it unless we had looked through a microscope at a drop of the warm water in a little pool on a bare sandy beach. In this drop we would have seen a little quivering fleck of

green jelly not as large as a grain of sand, but ALIVE!

Just the right amount of water, and air, and salts washed from different parts of the earth, had come together to form this new thing. It could do what no grain of sand could do—what even the greatest scientists living to-day cannot do: when the sun shone on it, it could

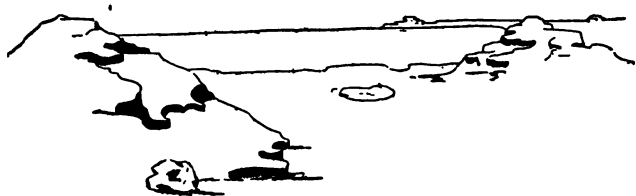


Fig. 1

The pool on the barren shore

take the water and part of the air and put them together to make food for itself. And it made this food and grew.

When it had grown twice as large (but still it was not as large as a grain of sand) a little crease appeared around its middle, and the crease grew deeper and deeper until the little green droplet of jelly was divided into two halves. And each of these was a tiny living cell, just like the first quivering drop

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that formed in the pool. These little living green cells drank the water and breathed the air. But, like the first cell, they did n't drink through their mouths, for they had no mouths; and they did n't breathe through their noses, for they had no noses—nor throats, nor lungs, nor heart, nor anything of that sort. The water just oozed into the whole cells, and the air did the same. Then, as the sun shone on them, the green stuff in the cells put the air



Fig. 2

How one cell became two

and water together to make more food. And both cells grew fat, and both divided in two, just as the first had done. And then there were four little live green cells floating around in the warm water and really enjoying life.

But there was plenty of water, and plenty of air, and plenty of sunshine; so these four little cells soon grew big and fat—each one almost as large as a tiny grain of sand. Then they all split, and there were eight little cells float-

ing in the pool. They quickly grew fat and split and then there were sixteen of them. These grew and divided and there were thirty-two; and they all grew and divided, and there were sixty-four live and healthy little green cells. And all sixty-four of them drank the water, breathed part of the air, and changed these into food on which they soon grew fat. Then each one split and there were one hundred and twenty-eight. And they drank and breathed and grew and split and there were two hundred and fifty-six. These soon split again and there were five hundred and twelve. Then there were one thousand and twenty-four. Then there were two thousand and forty-eight. And the whole two thousand and forty-eight drank the water, breathed in part of the air, made food for themselves and grew fat. Then each one split and four thousand and ninety-six little green cells were floating around in the pool.

Soon the pool was fairly swarming with these tiny living things. And then perhaps an extra big wave came up, or perhaps an extra heavy rain came down, and most of the cells

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were washed out of the pool and into the ocean. Some were stranded in the mud; some stayed in the pool, but many of them were carried by the ocean waves far out to sea.

But still they had light and water and air and could grow fat and split; so there came to be more and more and more of them. Some were washed ashore on distant islands, some spent all their lives in the sea. But all of them grew and split, and grew and split, until there were millions and millions of tiny green cells scattered all over the world.

Mother earth was waking up.

The little cells were not all alike—in fact the more they split, and the more places they washed into, the more different they became. Finally, one green cell found that it was only



Fig. 3

How the first white cell may have been formed

half green; and when it split, the white half found itself floating in a pool of green cells, and found that it was the only living thing that was not green that had ever been on earth.



You would n't think that a little matter like color would have bothered it any; but it found to its dismay that the color mattered a great deal—for without its green color its magic power of putting water and part of the air together to make food was gone! It floated around desperately in the sunlight, drinking water and breathing air galore, but starving fast.

A little ripple washed a small green cell over beside the white one; and the white one clung to the little green one for help. The white cell got help all right, but the poor little green cell lay dissolving inside of it. This made the



Fig. 4

How the white cell ate the green one

white cell grow fat, but did not make it grow green. Pretty soon the white cell was fat enough to split and a little crease appeared around its middle. This deepened and deepened, until the white cell fell into two halves—each half a white cell, and neither half able to

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make its own food. One half was able to wiggle just a little, and it squirmed through the pool toward a green cell, and slowly swallowed it. But the other little white cell could n't squirm so well and soon starved to death in the pool.

The half that lived grew fat and split into two squirming white cells; and they both ate green cells and grew fat and split into four; and they squirmed through the water after more green cells, and all grew fat and split until there were eight. And so the white cells multiplied, eating the green ones and learning more and more how to wriggle and squirm through the water.

Little by little there came to be almost as many tiny white cells, scattered by the waves all over the earth, as there were green ones. The green cells did n't get all eaten up because they grew and split even faster than the white ones could eat them.

And for millions of years the little white and green cells spread themselves all over the world and grew more and more different.

One day a green cell that lived in the mud

beside a pool split in two as all the others had done; but this time the two halves stayed side by side. When these two halves split they too stayed together, so there was a string of four little cells. And all four of these when they split stayed together, making a string of eight.



Fig. 5

How the green cells clung together

As they kept dividing and staying together the string of cells grew longer and longer, until after a while there was a string of cells over an inch long—several hundred of them all in a row.

Half of this string of cells lay within the shadow of a stone. The other half lay in the sunlight. The half that was in the shadow found plenty of water in the dark wet mud, but it had very little light—and the green cells must have light as well as water and air in order to make their food. But the half that was in the light did not have enough water to make its food. So the cells that were in the dark sent part of their water up to the cells in the light.

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These made the food and sent part of it back to nourish the cells that were in the dark.

Trading work this way all the cells in this green thread grew fat and divided very quickly. To get water enough for so many cells, those that were in the shadow of the stone had to burrow down a little into the dark mud. And to get more air and light, some of the cells that

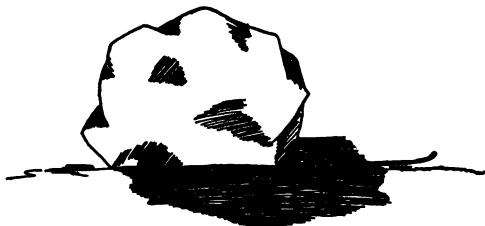


Fig. 6

How the first root and leaf may have begun

were in the light grew upward off the ground. And in this way the first real plant was formed with a root and threadlike leaf. This plant was able to live after the top of the mud dried up, although the other groups of cells around it died from want of water.

There were probably strings of cells like this formed all over the earth. Sometimes, instead of growing as a long single thread, the cells

would stay together in little flat circles like clover leaves, or would branch out into a sort of small greenish feather. And all over the earth when groups of cells divided their work—some of the cells going down into the earth for water and some going up for air and light—those little plants were best able to live. So in time there came to be many hundreds, then



Fig. 7

How the first plants probably looked

thousands and thousands of them. And finally, thousands of years later, some of them grew extra cells which they dropped off; when these fell into the mud they divided and grew just as the plant which dropped them off had done, and formed new plants like their mothers.

In this way, after millions and millions of years, our waking mother earth covered her land with growing plants and filled her oceans with seaweeds.

But what had the little white cells been doing

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all this time? Very much the same thing that the green ones had been doing. Many of them stayed together when they divided and formed small groups. Then the cells in the group traded work just as the green ones did,

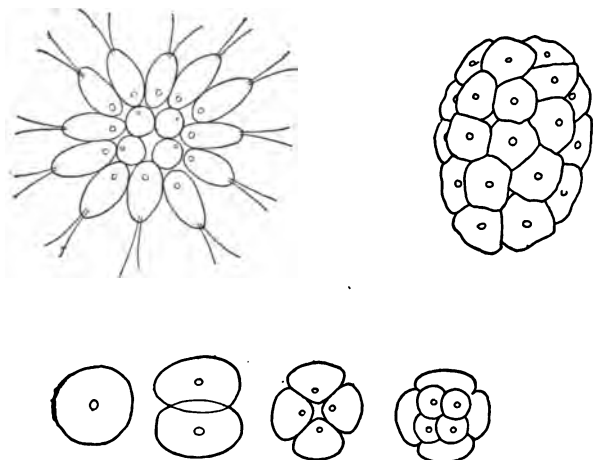


Fig. 8

How the white cells clung together

but they did n't form roots or leaves. Instead of this, some of the cells did the work of pushing the group along and became legs or fins. Other cells did the work of grabbing the plants for food. They became mouths. Other cells made this food over. They formed the stom-

## HOW THE EARTH CAME ALIVE 33

achs. In this way strange little animals were formed, some like sponges, some like jelly fish, some small and some large.

Many of the larger animals ate the smaller ones, so the small ones to protect themselves took the lime from the seas and rivers and made it over into shells. Some that were on the land grew filmy wings and became the insects of the air.

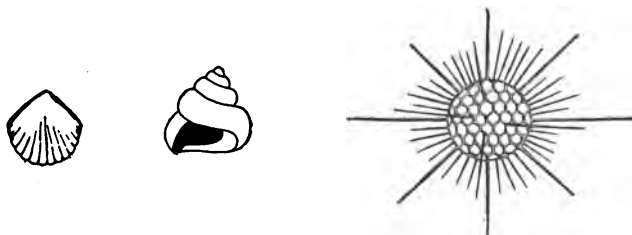


Fig. 9

How the white cells protected themselves

And so after millions of years our earth came to be covered with all sorts of living creatures moving in and out among the green plants, eating the plants or each other. Century after century the plants and animals changed, and new and different kinds kept growing. But all the plants were made out of hundreds and thousands of little green cells,

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something like the first green cell, and made their food out of the water and part of the air whenever the sun shone on them. And to this very day every plant that you see is really made like these first plants of just such tiny green cells. And the animals then, and the animals

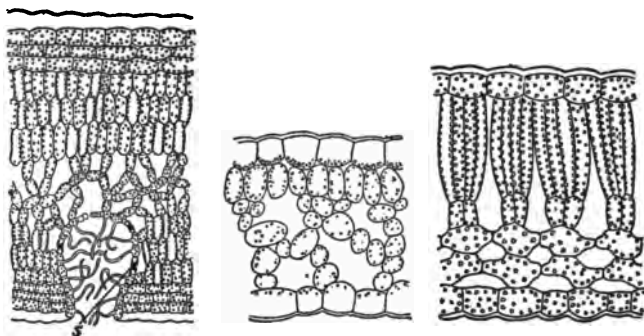


Fig. 10

How plants are built of cells now

Diagram of the edges of three cut leaves as seen through a microscope

now, are made of little white cells, dividing their work and living off of plants or each other.

. . . . .

Nobody is perfectly sure that the plants and animals started exactly as I have told you—it was so many millions of years ago. But this



## HOW THE EARTH CAME ALIVE 35

story is *probably* true for the most part. And it is *surely* true—as you can tell by looking at any green plant under the microscope—that plants are made entirely of little cells, a good deal like the first green cells in the pool so long

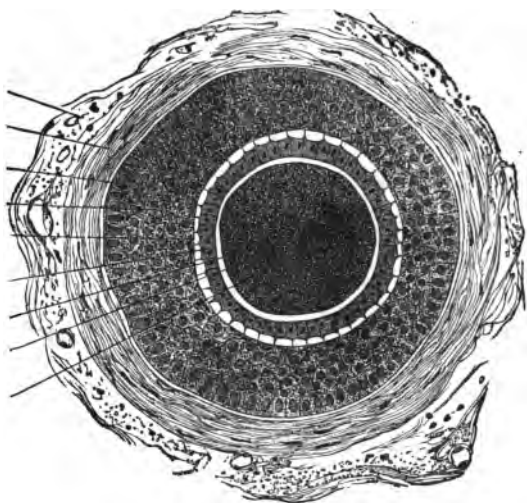


Fig. 11

How animals are built of cells now. This is one hair cut across as seen through the microscope.

ago. And it is sure that animals—and even you yourself—are made of millions of little cells like the first white ones in the pool.

And what is perhaps most wonderful of all

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is that right now every living thing *begins* its life as just one little cell no bigger than a pin point. This eats and grows and splits like the cells in this story, until there are the millions of cells that make the grown up animal or the grown up plant.

## CHAPTER IV

### THE COAL AGE

**I**F we should begin to count right now, and count as fast as we could, all day to-day, and all night to-night, and all day to-morrow, and all to-morrow night, and all this week, and all next week, and all this month, and all next month, and four months after that, we would just barely be able to count the number of years that have gone by since the things happened that I am going to tell you about in this story. Yet it was long, *long* after the things which happened in the last story—in fact, it would take you years instead of months just to count the number of years that passed after the first life came on earth.

If we had been here about fifteen million years ago we would have been the only people on all the earth. There would not even have been birds or flowers. I don't think we would have sat down on the ground, for it was wet

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and squudgy, with water oozing up among the roots and soggy, matted leaves. The trees were giant ferns and the mosses grew as high as bushes.

Buzzing and droning all day among the leaves were thousands and thousands of insects—dragon flies, beetles, and all sorts of other strange winged things. And then there were snakes and funny lizard-like creatures crawling around among the roots and slime.

In a cave near the edge of the forest there lay a great creature. He was something like a lizard, but longer than the tallest man you have ever seen. He was a slimy green color and covered all over with yellow warts, and he had a row of yellow spines which stood up all the way down his back bone to the tip of his tail. He really was n't a very pleasant looking creature—although he seemed to be always smiling, but this was only because his teeth showed all the way around his enormous mouth. But the strangest thing about this hatteria (for that is what he is called) was that instead of having two eyes as all the other animals had, he had—*three* eyes. The third

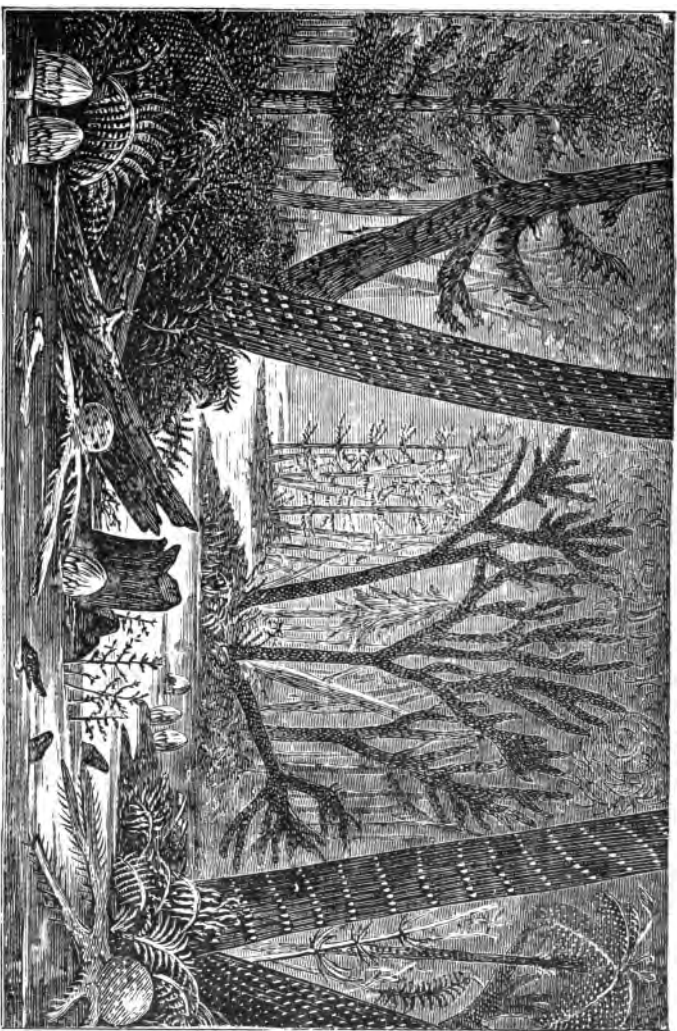
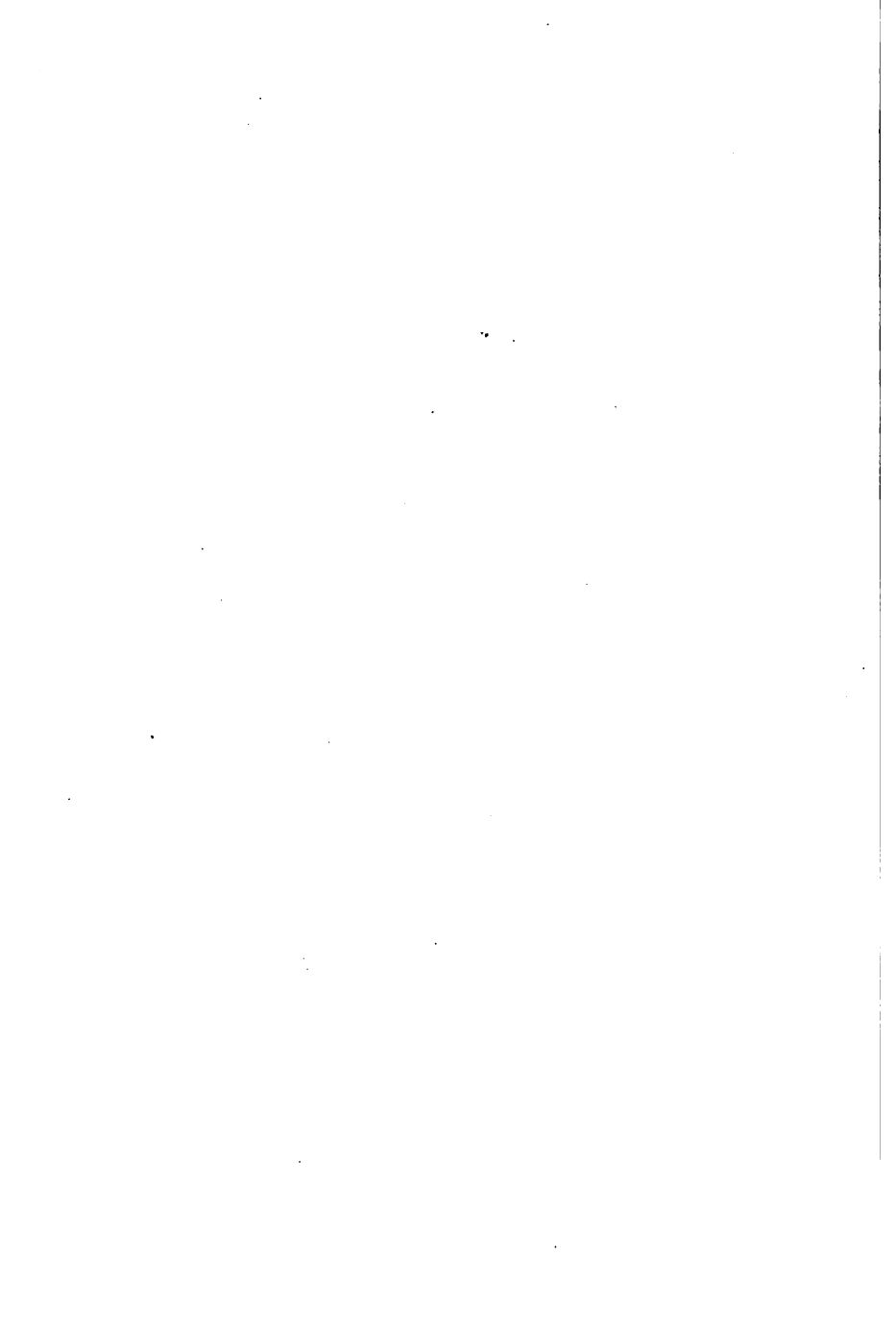


PLATE 3. THE COAL AGE

From Herrick's "The Earth in Past Ages." Copyright, 1888 by Harper and Brothers. By permission of American Book Company Publishers.



one was right in the top of his head, like the three-eyed giants in the fairy stories. He lay there in the mud half in and half out of his cave, blinking the two eyes on the sides of his head, and looking almost asleep. But his third eye stared steadily at the sun. He did n't blink it, strange to say, because it did n't have any lid,—just a sort of horny covering which was clear so that he could see through it, but too hard to be hurt by anything. He really looked too lazy even to go after food.

But if we had watched him long enough we would have seen him pull himself together and slowly crawl off to follow one of the many little brooks that ran through the forest, down to the edge of the sea. Here he lay so still that he looked like a big old log washed up on the shore. But he was wise, this old fellow, for all his stupid looks. For presently up out of the water came sidling a queer crab-like animal. Then quick as a flash the hatteria scrambled across the sand, caught the crab between his two great rows of teeth, scrunched its thick shell and carried it back to the cave, there to enjoy his meal in peace.



Fig. 12  
The Hatteria with his lunch



In these days there used to be terrible storms. The water would pour down, the lightning would flash, and the thunder roar and echo through the forests. Then some of the giant trees would crash down and splash into the swamp. There they would lie, almost covered by the water and tangled mass of roots and plants.

The water kept the air away from the trees as they fell, and so they never had a chance to decay. Year after year they lay there and other giant ferns fell on top of them until the whole forest was growing out of a thick bed of fallen trees and dead plants, kept wet by the many heavy rains.

All this time the animals did n't know that far down underneath the swampy forest the earth was slowly sinking and carrying the forest down with it. For hundreds of years the earth kept sinking and sinking and the animals had to keep moving farther and farther back into higher parts of the land. And after a while the water filled up even the cave where the old hatteria had lived, and the waves lapped around the trunks of the trees, and queer

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fish covered with bony armor swam in and out among the bushy mosses.

Little by little the whole forest sank beneath the water until the fishes were swimming above the tops of the highest trees, and the animals had all moved away, leaving the bones of the dead ones behind. Pretty soon the trees under the salty water also fell down and lay on top of the others. Then the rivers and streams from the mountains washed down sand and mud, which settled on top of these trees. When the fish that were swimming around above them died, their bones fell down and lay in the mud. So little by little a thick layer of sand and rocks and bones and shells formed on top of the sunken forest.

Century by century as the mud-covered forest sank deeper and deeper beneath the ocean, the thousands of tons of sea water above it slowly pressed the mud into rock and squeezed the very forest beneath into a solid mass almost as hard as the rock. As the crushed forest grew harder its color grew darker and darker until after thousands and thousands of years it

turned into a thick black layer of stuff as hard and black as coal—in fact, it *was* coal.

Then very slowly the great bed of coal and the rock above it began to push upwards. As thousands of years went by the sea above became shallower and shallower until finally all this land pushed its way above the surface of the ocean. Then the animals from the higher lands came down on to it, the rivers covered it with fresh mud, and trees and plants spread down and grew on it. Once more great swamps were formed with giant ferns and enormous mosses. Hatterias—the great, great, and many times great, grandchildren of those whose bones now lay bedded in the coal beneath, again hunted crabs along the shore.

After a long, long time the land again began to sink, again the great forest was covered by the sea. Again rocks were formed above it. Again the forest was crushed beneath the mighty weight of the ocean, and after thousands and thousands of years turned into coal. Again it all rose up and a third forest was formed. Then this sank beneath the waves

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and was turned to coal. And this same thing happened several times as the thousands and hundreds of thousands of years went by.

Several million years later, when men were on earth—in fact, not long ago—men in digging through the earth and rocks that had been formed since the coal age, came upon the great

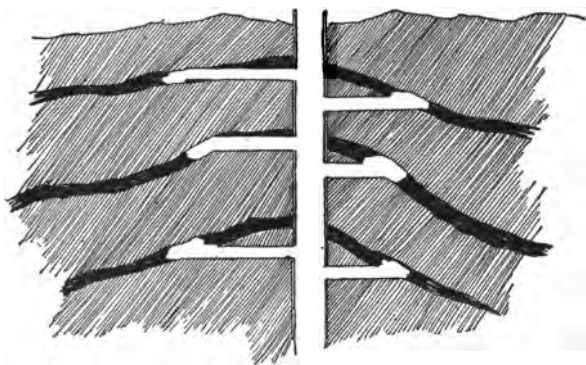
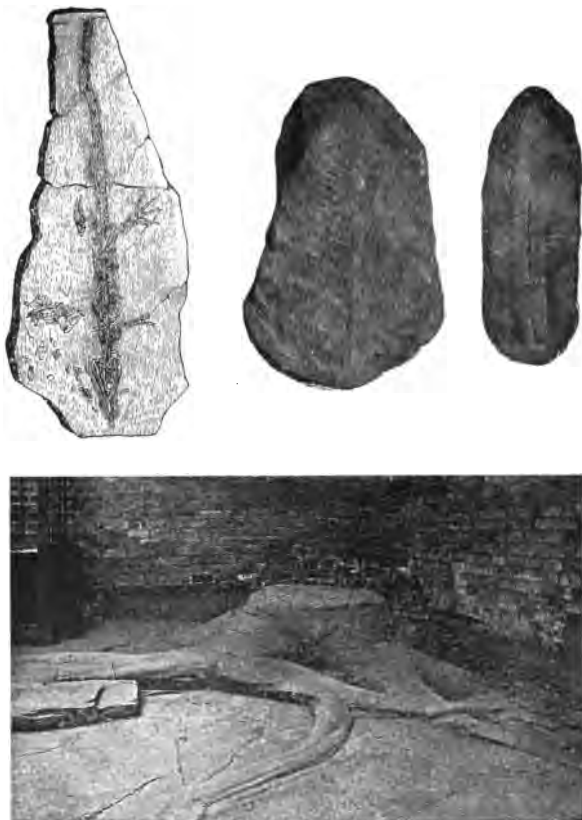


Fig. 13

How a coal mine looks inside

beds of coal and thought it was rock. Then they found that it would burn, so they began to build great mines and take it out from the earth.

If we were to visit a coal mine to-day we would go into a hole in the side of a mountain and get into a sort of an elevator. Then we



**PLATE 4. FOSSILS FOUND IN THE COAL**

From Chamberlin & Salisbury's Geology. By permission of  
Henry Holt & Co.



would drop deep down through layers of rock that had been formed since the coal age. After a while we would come to a thick black layer of coal with tunnels running through it. Along these tunnels we would see miners with tiny lamps on their heads to light the dark caverns. They would be chopping the coal and blowing great pieces of it out with dynamite. Then they would load this onto little cars, which would carry it to a big elevator, where it would be hoisted to the top.

As we went deeper we would pass a layer of the rock made of the mud which had covered another ancient forest. Then below this we would find the forest itself turned into a layer of coal and pierced with many tunnels.

Scientists have gone down into the mines and have studied the layers of rock between the beds of coal. They have found the bones of the armor-covered fishes that swam above the sunken forests. They have found the shells which drifted down to the bottom of the sea and helped to cover the forming coal. And they have examined the coal itself and found in it the prints of the leaves of the giant ferns

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and mosses, the trunks of the trees, the wings of the insects and the bones of the snakes and strange animals. They have even found the bones of the hatterias with holes in the tops of their skulls from which the third eye used to stare. This is how we know that all this story is true.

Several years ago some explorers were traveling in New Zealand and among the many strange animals which they saw, what do you think they found? Some live hatterias! These were lying on the rocks beside the ocean, each blinking two eyes and staring at the sun with the third. They were the great, great, great, great, great (I have n't room for enough greats—there should be more than a hundred thousand of them) great grandchildren of the hatterias that lived among the giant ferns of the coal swamp!

And they are living *now* on some little islands off the coast of New Zealand, protected from their worst enemies, the natives, by the English government. They are not so large as their ancestors, for they are only two feet long. But each one still looks too lazy to eat as it



blinks two of its eyes and stares stupidly at the sun with the dim remains of the third eye on the top of its head. But when a crab comes near one, quick as a flash he scrambles across the rocks and sand and catches the crab between his grinning rows of teeth. He scrunches its shell and carries it back toward his cave to eat it in peace—just as the hatterias did several million years ago back by the forests of giant ferns.

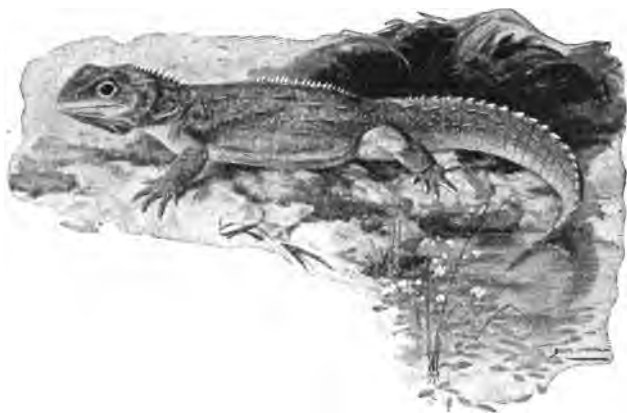


Fig. 14

The Hatteria now living in New Zealand

## CHAPTER V

### THE AGE OF TERRIBLE LIZARDS

**A** MILLION years passed after the coal was formed, and rocks covered the coal beds deep under ground. The plants slowly changed. There were no longer great swamps of tree ferns and giant mosses. New kinds of animals appeared, and flowers began to grow. Another million years passed, bringing more great changes. And yet there were no men on earth—not even savages—nor were there any apes, nor tigers, nor bears, nor even mammoths. For this was still six or seven million years ago.

Let's pretend that we can go back a few million years and look at the things that were here on earth.

Up in the sky there is something that looks like a large bird, slowly wheeling toward the earth. It comes nearer and nearer and we see



PLATE 5. THESE ARE THE THUNDER-LIZARDS (BRONTOSAUR) WHICH LIVED AT THE SAME TIME AS THE ANIMALS IN THIS STORY



that it certainly is large, but if it is a bird, it's different from any we ever saw before (or since). Lower and lower it sails, and as it gets closer it looks like an enormous bat. Its



Fig. 15  
The Fingerwing, flying

wings are leathery and look like parts of great umbrellas stretched from the creature's long finger. It is the great Fingerwing (Pterodactyl). Its eyes have a wicked gleam and its wings are so large that three tall men could lie end to end across them.

As the Fingerwing comes close enough for us to see how terrible he is, we hurry into the woods near by, where the branches are too close together to let the great Fingerwing fly in. We wander through the woods when all of a sudden a heavy thud shakes the earth near us.

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Then there 's another thud and another and still another—each one much louder and closer than the last one. When we finally get courage enough to look, there stands a creature as gigantic as it is strange, peacefully nibbling off



Fig. 16

Lizard-tooth eating his lunch

the tops of the small trees. He looks like an enormous kangaroo at first, but has a gray, scaly skin and is as large as a small house. He runs on his great hind legs, dragging his big clumsy tail behind him. His smaller forepaws clutch the branches and pull them toward him

while he eats the leaves, still refreshingly wet from the heavy rain of the night before. It's lucky for him that there's so much green stuff to eat, for that huge, hulking body needs several small trees to make a good meal. He is the Lizard-tooth (Iguanodon), a harmless, half-witted creature. Of course if he should accidentally step on us—for he probably would n't notice so small a thing as a human being—our bodies would be crushed into a spot of fertilizer in the earth under his feet, and would nourish some new trees for him to eat a few years later. But if we yelled in time he would probably lumber off on his hind legs toward safer regions where little creatures with loud voices would not disturb his meal.

We watch this great Lizard-tooth finish his supper, and then follow him down toward the river. He takes his time, but his great strides cover so much ground that we have to run to keep up with him. On the muddy bank of the river he leaves deep footprints as he drinks.

We decide to hide and see if any other strange animals come down to drink. In the water all sorts of queer fish are leaping and

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splashing around. But, look—quick! what's that smashing through the bushes? Did you ever see such a hideous monster! Look at those great bony fans in a double row all down his back. And that tail—why it must weigh over a ton. He has it protected all right with those sharp spikes sticking up all along it. We hope he's as friendly as Lizard-tooth—unless that would make him wag his tail near us. He walks just like a rhinoceros, except that his front legs are so short that they



Fig. 17  
The Plated Lizard

keep his thoughtless head down by the ground. He's called the Plated Lizard (Stegosaurus), but I dare you to find anything lizard-like about him.

And now what? Wow! just see what's





Fig. 18  
The Enormous Double-beam

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coming— Its small head is followed by a neck so long that it can almost drink the water before its body comes out of the woods; then comes a huge body something like that of the Lizard-tooth, and behind this is a long tail like the tail of a crocodile. If only it were tame, thirty children could sit astride along its neck, and thirty more along its tail, and fifteen or twenty grown-ups could ride at ease on its great back. For this is the biggest animal that has ever lived in all the world, the Double-beam (*Diplodocus*). He could easily look over the roof of a three-story building if there were such things at this time. Yet for all his enormous body his brain is n't as big as a child's. The only thing he can think about is eating and keeping away from his enemies. Watch him drink! That water has a long way to go before it gets to his big stomach!

As night comes on we hear some noises that make us thank our lucky stars that we are only pretending to live back in these times. Even the great Lizard-tooth and Double-beam are frightened by those raucous growls that are something like the croaking of a giant frog.

As the snarly croak grows louder these two great creatures drinking at the river turn and leap away along the muddy bank, their heavy bodies forcing their feet deep into the muddy clay, and their tails making tracks behind them.

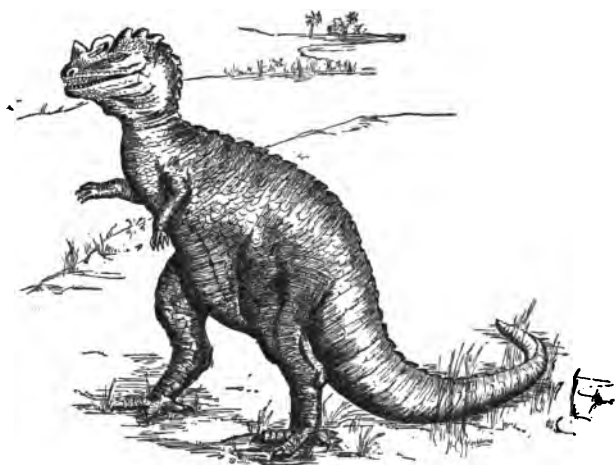


Fig. 19  
The Flesh Eating Dinosaur

But the huge Plated Lizard does n't wink an eye. He knows that his spiked tail and bony armor plates will keep him safe.

Closer and closer comes the horrible noise. Then suddenly the terrible flesh eating Dinosaur bounds out of the woods. He looks like

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a monstrous toad standing on its hind legs and is bigger than the largest tiger. His scaly skin gleams and his long, sharp teeth shine white in the moonlight. He hops swiftly toward our hiding place. If he sees us our lives won't be worth much. But luckily we are just pretending to be there, so he takes no notice of us, and rushes on past, straight after Lizard-tooth. As his horrible croaky snarls go off in the distance they seem to be catching up with the thuds of the fleeing Lizard-tooth. Then there is a roar and a squeal and we know that all of Lizard-tooth's size is of no use beside the strength and powerful teeth of the Dinosaur.

The next morning after the Dinosaur has eaten all that he can of the enormous carcass he goes down to the river to drink, and sleep in the sun. There is a shrill cry and leathery flapping of great wings. A Fingerwing, which has been watching for smaller prey, sees the feast the Dinosaur has left, and swoops down on the remains of Lizard-tooth. Other Fingerwings see him swoop and swiftly follow him to get their share. As they crowd all over the great body, with their wings folded, they look

like old women wrapped in enormous black shawls—but I must say that their long beaks full of sharp teeth snapping the flesh off of poor Lizard-tooth's bones do not look exactly lady-like. Soon there is nothing left but bare bones and the Fingerwings slowly spread their



Fig. 20

Fingerwings lunching off the remains of a Lizard-tooth

leathery wings out, and with a few flaps that blow the leaves on all the bushes around, they rise up into the air.

The hot summer sun beats down on Lizard-tooth's bones and bleaches them white. It beats down on the muddy clay by the river where Lizard-tooth's footprints are and hard-

ens them and the footprints of all the other animals that had drunk at the river that night. Day after day the sun bakes this mud until it is as hard as Lizard-tooth's bones and will last as long.

. . . . .

Thousands of years passed after this and the climate began to change. And there was n't enough food for great creatures like Lizard-



Fig. 21

One of the wise little furry animals

tooth and Double-beam and the Plated Lizard. So they died out. And then the flesh eating Dinosaurs did n't have enough to eat, so they died out. Just the smaller lizards

and snakes were able to live—and some little furry creatures that had good brains and could find lots of ways to get a living and to get away from their enemies. They became the ancestors of the animals we have now.

Three or four million years after this happened, in fact just a few years ago, some sci-



**PLATE 6. FINDING THE BONES OF A DINOSAUR**  
From a photograph. Courtesy of American Museum of  
Natural History





entists were studying the rocks to see how our earth was made. One day they found some strange cakes of sun-baked clay with deep footprints in them. Some of the footprints were too large to be made by any animal now on earth and they were so deep that the scientists knew that the creatures that made them must have been enormously large. Trailing along among the footsteps were marks of something heavy dragging behind, so the scientists knew the animals must have had large tails. And they tried to imagine what strange, gigantic creature could have made

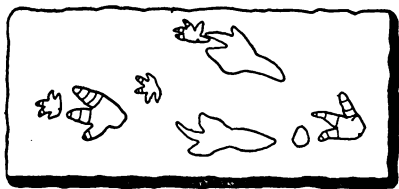


Fig. 22

Lizard-tooth's footprints hardened into rock

these marks. They knew by the formation of the near-by rocks that the tracks were made several million years ago.

Then one day they found in the rocks near where they had been working something white shining in the sun. They picked away the rock around it and found an enormous bone. They

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worked day after day and found one bone after another. They studied them carefully and found how they fitted together. They put them together, and behold! there was the skeleton of Lizard-tooth!

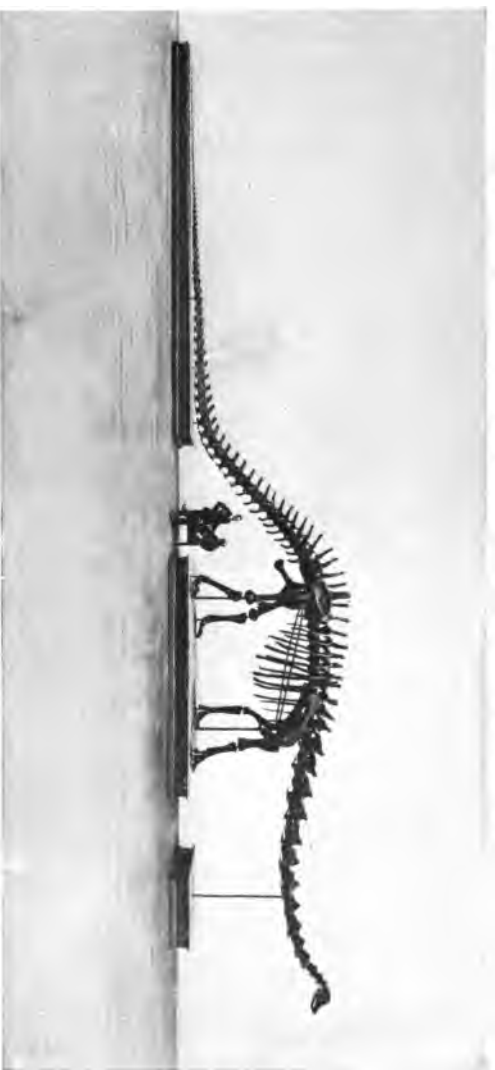
They compared its feet with some of the footprints in the baked clay and found that they would fit in some of the biggest. Then they searched high and low to find the bones of the other animals to match the other footprints. It took years and years of search by many scientists in many places to collect the bones of all these animals that lived so long ago. Indeed, they still are seeking, and finding more and more bones.

Imagine how surprised they were when they found the bones of the tremendous Double-beam! When they put his skeleton up they had to make a special building to hold it.

And because we have the baked footprints of all these creatures and their bones as well, we know for sure that they really lived.

. . . . .

(Note to Reader: If you want to know more about these strange creatures, read "Mighty Animals," by Jennie Mix.)



**PLATE 7. THE HUGE SKELETON OF THE DOUBLE-BEAM**  
Copyright by W. J. Holland. Courtesy of the Carnegie Museum



## CHAPTER VI

### THE ICE AGE

**M**ILLIONS of years after the Dinosaurs had died out, but at least a million years ago, the climate changed. For some unknown reason the winters grew longer and the summers shortened. Many plants were killed by the long cold winters, and many of the animals moved south toward a warmer climate. But some of the animals had long hair and thick fur and could stand the bitter cold and the northern winters. The mightiest of these were the mammoths. They were like huge elephants, larger than the elephants you have seen, and were covered with heavy coats of long hair.

Heavy snows fell all winter long and in the far north the short summers could not melt them. Colder and colder grew the climate and year after year the falling snows piled up, forming mountains of frozen whiteness. The

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great weight of all this snow packed the lower parts into solid ice. Still more snow came down until after many years the huge mass became so heavy that the solid ice beneath was squeezed along the ground and pressed southward. Slowly it advanced like a towering fort of gleaming ice, moving so slowly that you could not *see* it move. Yet so great was its weight that its power knew no bounds. Great boulders standing in its way were picked up like pebbles and carried on toward the south.

And still it snowed and snowed, winter after winter, and the great sea of ice was pushed farther and farther south. Tall trees looked like blades of grass before the massive front of this vast glacier and were ground to splinters as it slowly shoved across them. Only mountains could stand against the ice sheet's mighty push. When it came to them it would curve through the valleys between them, huge cracks or crevasses opening up as it turned, and closing again as the ice adjusted itself to its new path.

As the ice pushed southward it came to a warmer climate and the waves of heat from the hot summer sun beat against its stolid front.



**PLATE 8. THE TOWERING FRONT OF THE GLACIER**  
From Vol. 1 of Chamberlin & Salisbury's *Geology*, by per-  
mission of Henry Holt & Co.





Before this new attack the proud ice face melted and flowed furiously away in rushing rivers. But as the winter came on the front advanced again, pushed by the unending snows still falling farther north.

For thousands of years the great ice sheet



Fig. 23

The Glacier curving through the mountains and carrying boulders

pushed on. It covered Canada and Europe and shoved far down into the United States. If there had been big cities then, the great ice front would have slowly moved up toward the big buildings and towered over them for days like a menacing mountain of ice. Then with a ripping crash the buildings would have tum-

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bled to the ground as the stupendous force of the glacier gently pushed against them. A few weeks later the stones and iron of the building would have been a smashed and shattered mass with which the bottom of the glacier was plowing up stone-paved streets and grinding



Fig. 24

How the great glacier would have towered over a city

houses to dust. Luckily there were no cities here at the time; there may not even have been any men on earth yet; so the frightful force of the enormous ice sheet simply carved out valleys and left deep scratches in the rocks.

Farther and farther south the piling snows of the north forced the glacier. But very slowly the climate was beginning to change

again. The summers grew a little warmer and were not so short. The winters were not quite so severe. So when the ice sheet had reached half way down the United States its front melted as much in the summer as it went forward in the winter. The earth and rocks that it had picked up were left in hills in front of the melting ice plateau.

A mammoth was feeding one winter day on a mountain side in the far north. Below him stretched the great ice sheet for hundreds of miles in every direction, glistening in the sun. Although the glacier seemed to be standing still, there were strange crackling and snapping noises that showed it was moving and fitting itself to the curves of the mountain. As the mammoth lumbered along he snatched bits of moss and branches of pine with his strong trunk.

Suddenly a twig snapped behind him. He raised his trunk and sniffed, then with a wild trumpet plunged down the mountain toward the ice sheet. A moment later a great saber-tooth tiger leapt out from among the pines and tore down after him.

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As the mammoth reached the ice sheet he hesitated for a second, but rather than face his terrible enemy, he ventured out upon it. Soon he was sorry, for as he went out on the treacherous ice the cracking and snapping terrified him even more than the pursuing tiger. Suddenly in his headlong flight he saw a yawning crevasse just before him. He braced his feet to stop, but his huge weight carried him on over the slippery ice. Helplessly he slid over the edge and plunged down thousands of feet to an instant death.

The tiger's sharp claws dug into the ice and saved him just in time. Dizzily he watched the great hairy body of his prey disappear down the almost bottomless crack between the two shimmering blue walls of ice. And then he turned and loped back to the mountain side, scared and hungry and alone.

Slowly the ice moved on and the crack gradually closed above the mammoth. The mighty animal was carried slowly southward deep in his icy tomb.

Very, very slowly the summers lengthened. Sometimes they would melt the ice sheet back

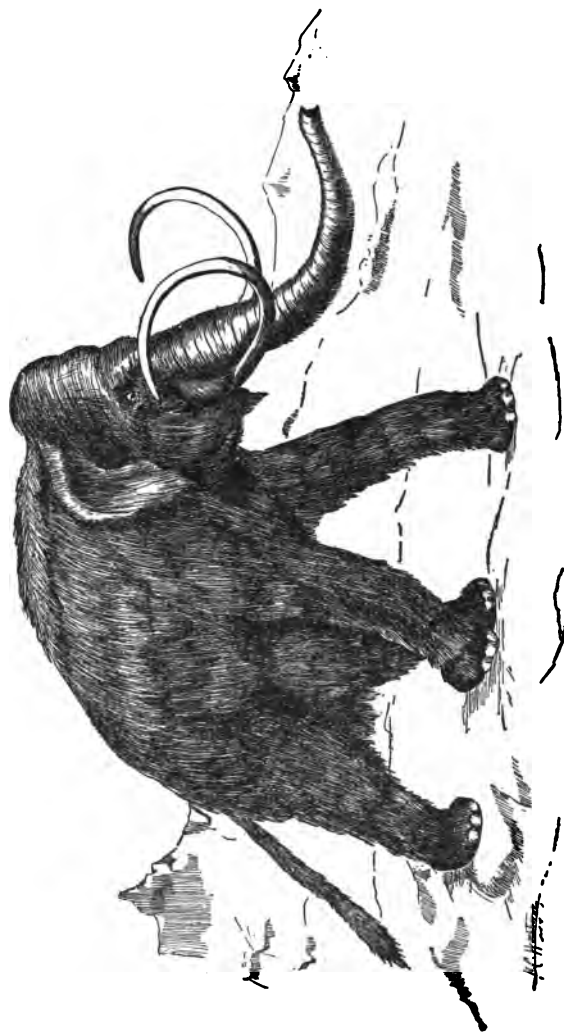


Fig. 25  
The flight of the Mammoth

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even farther than the winters could push it forward. The great Ice King who had reigned so long had at last found an enemy more powerful than himself. The invisible heat of the sun proved stronger than the billions of tons of ice. Year by year, century by century, the front of the great glacier melted.

As it melted back across the valley where the Great Lakes now are, a tremendous mass of rocks and soil that it had brought with it from further north were left behind until a dam was built. This kept the swirling waters of the melting ice within its bounds. More and more water gathered in the basin until the Great Lakes were formed.

When these could hold no more the water sought some way to escape. And it found a bank far to the northeast, a little lower than the other shores. First a tiny stream trickled over the side, then the stream widened and deepened and grew into a river. But just where this river left the lakes it passed over a bed of very hard rock in which it could scarcely carve a channel. Beyond this the earth was softer and the river soon wore away a deep

gorge, down which it swept toward the sea.

As the gorge deepened the water tumbled over the rocks into it in shining cascades. The gorge grew deeper and deeper. More and more water poured into it over the ledge. Finally the overflowing waters from the four Great Lakes hurled themselves over the bed of rock—and there were the magnificent falls of Niagara.

Thousands of years went by and the warmth of the sun melted the glacier farther and farther toward the north until finally it was driven back almost to the arctic regions.

. . . . .

A few years ago a party of explorers in the north were examining the front of what is left of the glacier. They saw something buried in the crystal ice that puzzled them. "Is it a boulder?" they asked. "What a queer shape for a boulder!" It was summer time and the ice was slowly melting; so they came back in a few weeks to see what the sun had uncovered.

The thing was still incased in the ice but so

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near the front that they could see it clearly. It was the *mammoth* which had fallen down the crevasse thousands and thousands of years ago!

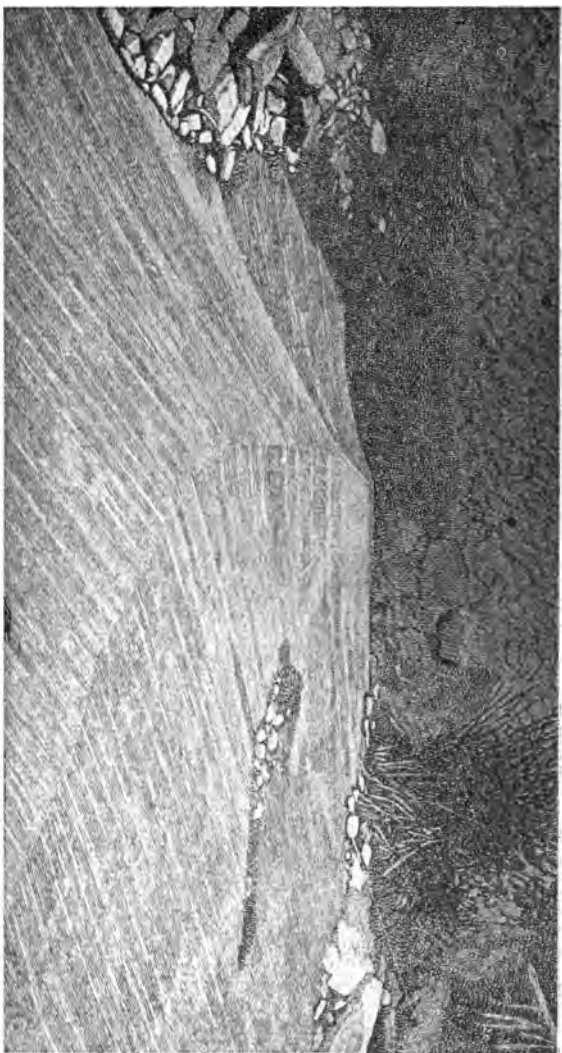


Fig. 26

Finding the Mammoth in the ice

With pick and ax they chopped it out. The ice had preserved it from all decay and a bit of the moss it had been eating was still in its mouth. Their dogs rushed upon the carcass and as the explorers saw that the meat was





**PLATE 9. THE WAY THE GLACIER SCRATCHED THE ROCKS**  
From Chamberlin & Salisbury's *Geology*, by permission of Henry Holt & Co.



actually good, they cooked part of it for themselves and declared that it made a delicious meal!

. . . . .

Geologists—those men who love to study the earth and read the stories in the rocks—found great rock beds, in parts of Europe and America, with deep scratches in them. And the scratches ran from north to south. So they knew that something very heavy must have rubbed over them going southward.

They found hills of rocks and sand which matched the rock beds farther north lying on southern soil. Something must have moved these from the north to the south. Huge boulders lay on top of the ground as if set there by some gigantic force.

The geologists watched the glaciers in the Alps and the larger ones in Alaska and Greenland. They saw how these were made and how they moved. When the glacier fronts melted in the summer they saw them leave hills of rock like those they had found in the warmer parts of Europe and America. They saw how these glaciers scoured the ground in deep scratches

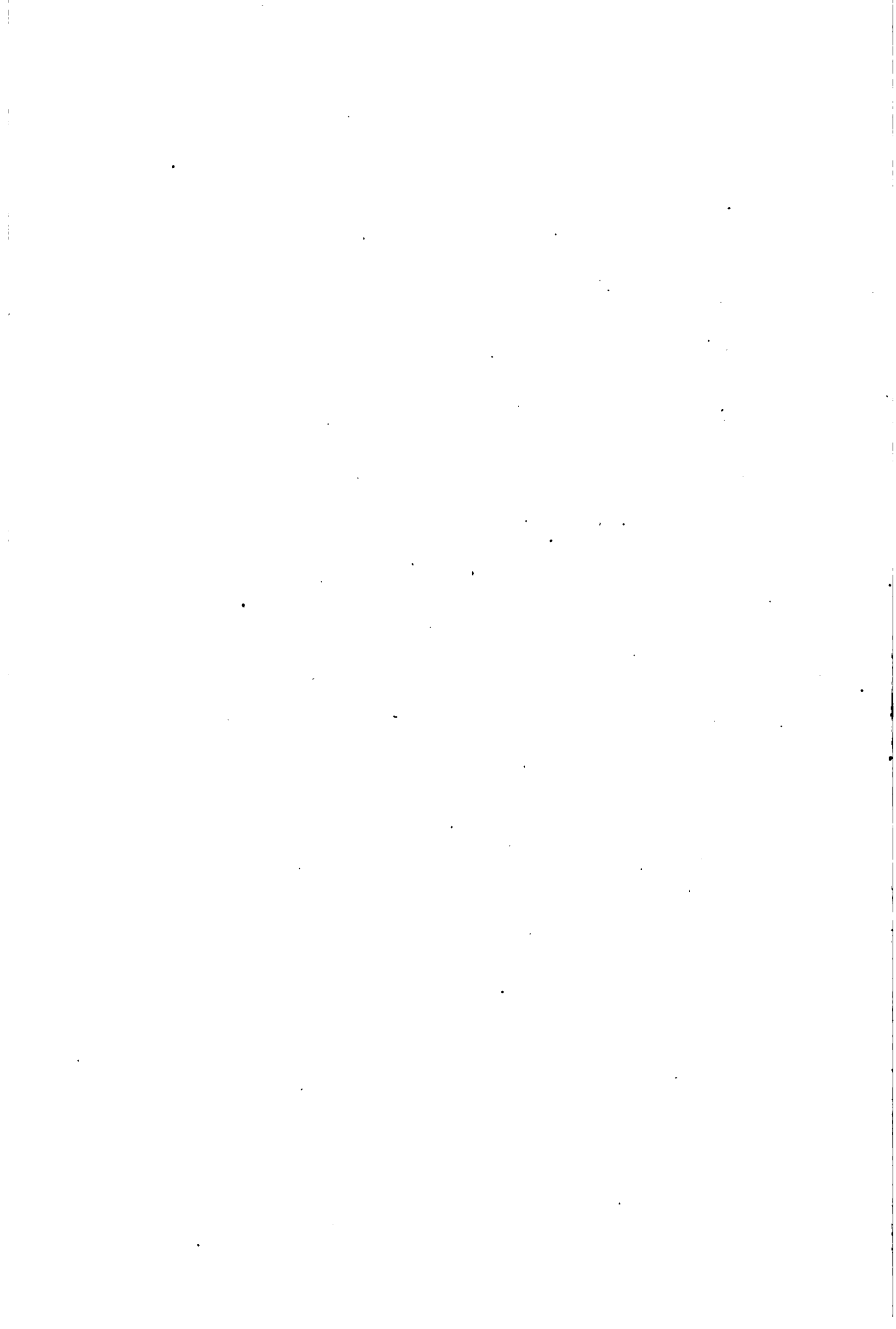
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with the rocks they carried with them. They saw great boulders roll from the mountain sides onto the glacier's top and years later saw the melting glacier lay these boulders like pebbles on the ground.

These things and many others proved to them that the great ice sheet came down as you have read. But as they studied more and more they even found that long before this age of ice there had been other glacial periods. Again and again in the history of the earth the heavy snows around the poles have pushed vast seas of ice toward warmer countries. Even before the Age of Coal the ice had covered great stretches of land. And possibly long after we are dead the weather will again grow cold and the northern snows again will slowly shove mountains of ice over our fertile fields and forests.



PLATE 10. A BOULDER DROPPED BY THE GLACIER  
From a photograph. Courtesy of New Jersey Geological Survey



## CHAPTER VII

### MEN OF LONG AGO

A BOY woke up one morning, turned over in bed, yawned, rubbed his eyes and looked around him. His bed was n't nice and springy and he did n't have snugly warm covers over him. He did n't have any clothes on, either. He was lying on the hard ground, and what do you think he had for a blanket? A tiger's skin! For, you see, all this happened over a hundred thousand years ago.

Over in one corner of the cave, for that was the only house he knew, he saw two savages sitting—a man and a woman. They did n't look the least bit like people now-a-day. The man was very hairy and had a black beard. He had hardly any forehead and almost no chin at all. The only thing he wore was a wolf skin and he had great powerful arms, longer and stronger than men have to-day.

And the woman you would hardly call beau-

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tiful, for she was hairy too, with arms almost as big and strong as the man's. She wore the skin of a queer animal fastened around her for a dress. The hair on her head was all matted and looked as if it had never been combed—as indeed it had n't, for they did n't have combs or brushes in those days.

The boy in the cave grew very hungry and he wanted his breakfast; he was n't to have any oatmeal and cream—not a bit of it! For in the first place there were no oats, and in the second place there were no machines to roll the oats out into flakes, and finally there was neither sugar nor any tame cows to get milk from.

While he lay there all wrapped up in the tiger skin, the man went out of the house with a long stone-headed spear. When he came back he had several big fish that he had speared right out of the water. The woman took these and put them on a long stick and held them over the fire which was burning brightly in the doorway of the cave. It was n't long before a delicious smell of broiling fish was filling the boy's nostrils and he grew hungrier and hungrier.





**Fig. 27**  
**The cave man bringing home some breakfast**

While they were cooking the boy jumped up and ran out doors to gather some more wood for the fire. When he came in the fish were done and his mother (the two savages were his mother and father) yanked one off the stick and threw it over to him to eat and kept the others for herself and the man savage. My, how eagerly he ate it and how good it tasted! When they finished eating there were n't any dishes or knives and forks to wash, for when they ate they just held their food in their two hands and gnawed it off in big juicy bites.

After breakfast the boy's mother had left the cave carrying a large skin and his father had gone hunting; so the boy was left to amuse himself. He played in front of the cave in the warm sun, throwing stones into the brook near by to watch the circles it made, climbing up into the trees and swinging on the branches, and then diving into the brook to refresh himself in the cool shining water—for he could swim as well as any fish.

He had been playing this way for some time when he accidentally stepped into a den of wild boar cubs hidden in the bushes. Their squeals

brought their fierce mother, with her long tusks, rushing through the bushes. When the boy heard the noise of the boar's charge he was terribly frightened and started to run for the cave. He was within a few feet of the entrance and could hear the snorting of the animal as it came,

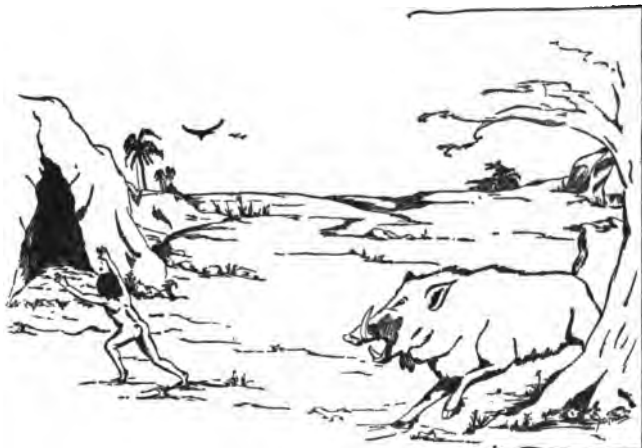


Fig. 28

The Boar chasing the boy

when he caught his foot in a trailing vine and fell headlong! While he was trying to get to his feet again a strong hand grabbed his arm and yanked him safe inside of the cave. His mother had come home in the nick of time and snatched him away from danger with her pow-

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erful hairy arm just as the angry boar charged by.

Things like this were really common occurrences in those days; so after the boar was well out of sight, the mother, quite undisturbed, went out to gather up all the roots and nuts she had spilled in her hurry to save the boy. She threw him some of the nuts and told him to crack them with a stone. The roots she put into the fire to roast for supper. And when the man returned from the hunt he brought with him a fine big deer that he had killed.

Some time after they had all eaten their supper and gone to bed, the boy was awakened by stealthy footfalls and the snapping of twigs just outside the cave. He pulled his tiger skin up tightly to his neck and then peered out. Two gleaming green eyes were staring hungrily in over the dying embers of the fire. He was just going to call out when his father leapt up with an angry shout and threw more wood on the glowing coals. As the flames blazed up the two green eyes blinked and then disappeared into the darkness. And the boy went peacefully back to sleep again.

When he woke up the next morning the wind was blowing torrents of rain past the mouth of the cave. There was thunder and lightning and a raging storm. Even the man decided to stay in that day. The boy grew restless in the cave and tried to amuse himself with first one thing and then another, but nothing was very much fun. Then seeing his mother cleaning a skin with a sharp stone and thinking to help her, he took up one of the stones and began to scrape too. He scraped too hard in places and made holes in the skin. This did n't please his mother at all and she growled at him to stop scraping. But he went right on. She gave another louder growl and when he still did n't pay any attention to her, she raised her big arm and gave him such a cuff over the ears that he went sprawling over to the other side of the cave, with his ears ringing and his face smarting.

One could hardly blame him for crying as lustily as he did, but his father would have none of it, and growled at him in a way which meant, "You stop crying or I'll put you outside." In another minute the boy found him-

self out in the cold and rain. He shivered and his teeth chattered and he wished he was in by the warm fire. So he soon swallowed his sobs and with a hanging head slunk back into the cave.

In a few minutes he became interested watching his father work, and forgot all about his punishment, for his father was making the queerest kind of tools—knives and spears and all sorts of other things—out of wood and stones. He would take flint stones which he had collected from the brookside, and chip them together until they were sharp on the edges. Then he would bind them with leather thongs to pieces of wood—some long for spears and some short for knives and hatchets.

When the man had finished he took up one of the stones he had sharpened and started to draw with it on the wall of the cave. The boy was fascinated and watched with the greatest interest the huge mammoth with its shaggy fur and the broad-horned elk come alive on the cave wall.

By this time the storm had died away, so the man left his drawing and went out with one of

his new spears to kill something for dinner. The boy went out too. He was tired of staying in the cave all morning and thought he

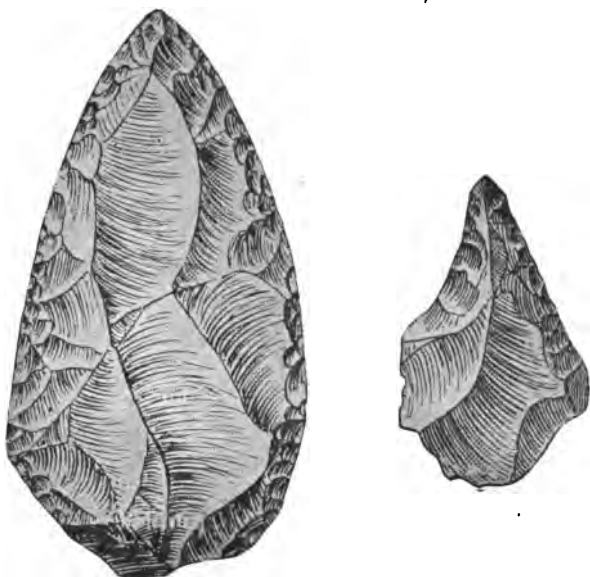


Fig. 29

The weapons the father made

would try to find some flint stones to make himself a spear.

He had been wandering along the edge of the brook for some time when he heard a tremendous noise of angry growls and frightened shouts, not far off. He recognized his father's

voice calling for help, so he rushed as fast as he could in the direction of the noise. Before he had gone far he saw his father fleeing toward a cliff and a huge cave bear rushing after him!

There was nothing the boy could do but watch, horrified, and wonder what would happen. Suddenly he saw his father leap onto a ledge of the cliff. Here his father braced himself and turned to face the bear, holding his spear before him. Clumsily the big cave bear scrambled his way up until his head was above the ledge and his huge paws almost touched the man's feet. But when the bear saw the spear pointing down at him he hesitated for just a second, glaring hungrily at the man. Then with a savage yell the man lunged with his whole weight and forced his spear down the open red throat of the enormous brute. The bear fell backwards and went rolling and bumping down the cliff. The boy rushed up to where the bear lay, overjoyed that his father was safe. Together they hacked off a hind quarter to roast for their dinner, leaving the skinning until the next day. Then they started off for the cave, happy that they were going



to fill their own stomachs instead of filling the bear's.

Several years passed and the boy grew tall and very strong. He practised a great deal with his spear and went on many a hunt with his father. But he had never been on one of those rare hunts when the cave men banded together to attack their most dangerous enemies. His father had steadily refused to take him until he became more expert in the use of his spear and knife.

But one day the boy was rewarded—his father told him that he could go with the band of cave men next morning to hunt the saber-tooth tiger. This great animal had carried off two or three of the cave men lately and was the most feared of all the forest animals. Every hunter was needed.

The boy was greatly excited at the prospect of such a hunt and spent all the rest of that day sharpening his stone weapons and preparing to start off early the next morning.

At last when everything was ready, the men decided to scatter in different directions to find the last trace of the tiger. It was agreed that

whoever found the first clue would return to the meeting place and summon the others.

The boy was running through the tangled woods keeping up with his father when all of a sudden he saw him stop, stoop down and examine some footprints in the soft mud near the edge of the stream. Then his father jumped up with a shout and went leaping and running as fast as he could, back to the meeting place. Never a word did he stop to say to the boy, who was wondering what to do—not knowing just what his father had found or was running away from. He did n't stop long to find out but turned and went chasing full speed after his father, who was calling loudly to the other men. When they all got together his father told them that he had found fresh prints where the tiger had probably stopped to drink only a short while ago.

In another minute they were all off again with burning torches and sharp spears. Near the stream they found a half-eaten deer, part of the tiger's breakfast, most likely. So they hurried on, treading silently and looking cautiously in every direction. Presently they

heard a tremendous *crash* and an angry snarl of rage. A short distance in front of them the bushes were trampled down and out sprang the most terrible beast the boy had ever seen. He came rushing at the men, his mouth wide open, showing his long dagger-like teeth and curling red tongue. The men almost turned and ran, but the boy's father reminded them that their only safety lay in the tiger's fear of fire. So they flourished their burning branches in its very face. The tiger hesitated for a moment, then turned, snarling, and fled.

With yelling and shouting the men started after him, throwing their spears. Two of these struck the side of the huge beast, but did not stop him. Only a growl of pain, and he was off again crashing through the bushes. The woods were filled with the roars of the tiger and the cries of the men as they rushed after their deadliest enemy.

They were going to try to chase the tiger under a steep cliff. This was far from easy. The tiger was used to doing the chasing himself, so he turned again and again upon his pursuers with flashing sword-like teeth and

terrifying roars. But each time he was met with flaming branches which blinded him and singed his fur, and with a volley of stone-headed spears hurled with tremendous force.

As the men chased the tiger, pulling off dead branches of the trees to renew their burnt out torches, they gradually spread out in every direction, inclosing the terrified animal in a circle of fire, the only outlet of which would lead him to his death at the foot of the cliff.

When the tiger was well started in this direction the boy and some of the swiftest runners cut across to the top of the cliff. Here, on the very edge, was poised a big boulder. The men had worked it up there the day before to have everything ready.

From this point the boy could see all over the surrounding country. He heard the roars of the angry and wounded tiger. He saw the flames of the torches appearing and then disappearing again among the trees.

Suddenly he saw something that made him shout to the other men to look. The tiger was just appearing among the sparse trees at the edge of the woods. He limped and was drip-



**PLATE II. THE SABER-TOOTH TIGER**  
From a painting by Charles Knight



ping blood at every step. Behind him came the men. When those on the cliff saw him they quickly slipped strong pieces of wood under the side of the boulder.

The boy was leaning far over the edge of the cliff to give warning just when to push. Closer and closer came the tiger, snarling with rage and pain.

In another second it would be time.

The boy gave the cry. The stones beside him rattled, there was a *whish* of something heavy falling through the air, a heavy thud and then a terrible snarl that was never finished.

The saber-tooth tiger was dead.

. . . . .

Thousands and thousands of years went by and men learned more and more. They learned to make boats; they learned to take metals out of mines and make knives and spears and shields; they learned how to make grasses grow larger seeds until they bore grains for men to eat; they learned how to make houses. And finally they learned how to write, making up an alphabet out of pictures. But it was so long a time—hundreds of thousands of years

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—before they began to write, that no history of the first people was kept. So history does n't begin until a little over five thousand years ago (which is just a few minutes ago in the earth's life). And no one knew until lately about these first savage men who were our ancestors.

Then those scientists who are always look-

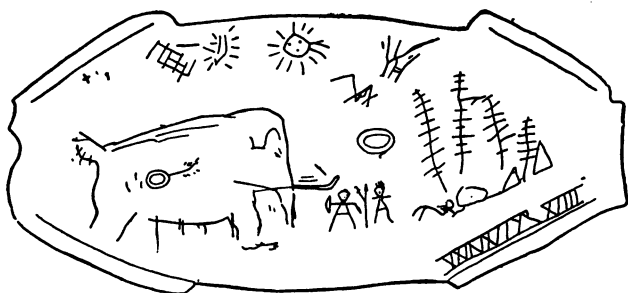


Fig. 30

Drawings made by the cave men and found by scientists

ing in the rocks, where the earth has written a history so much older than man's history, found some caves where these early men had lived. They found on the sides of the caves the drawings which the boy in this story watched his father make—drawings of hairy mammoths and broad-horned elks. And they found the stone heads of the spears that the



father had used, and the bones of the animals he had hunted and eaten. They even found his skeleton buried by the cave.

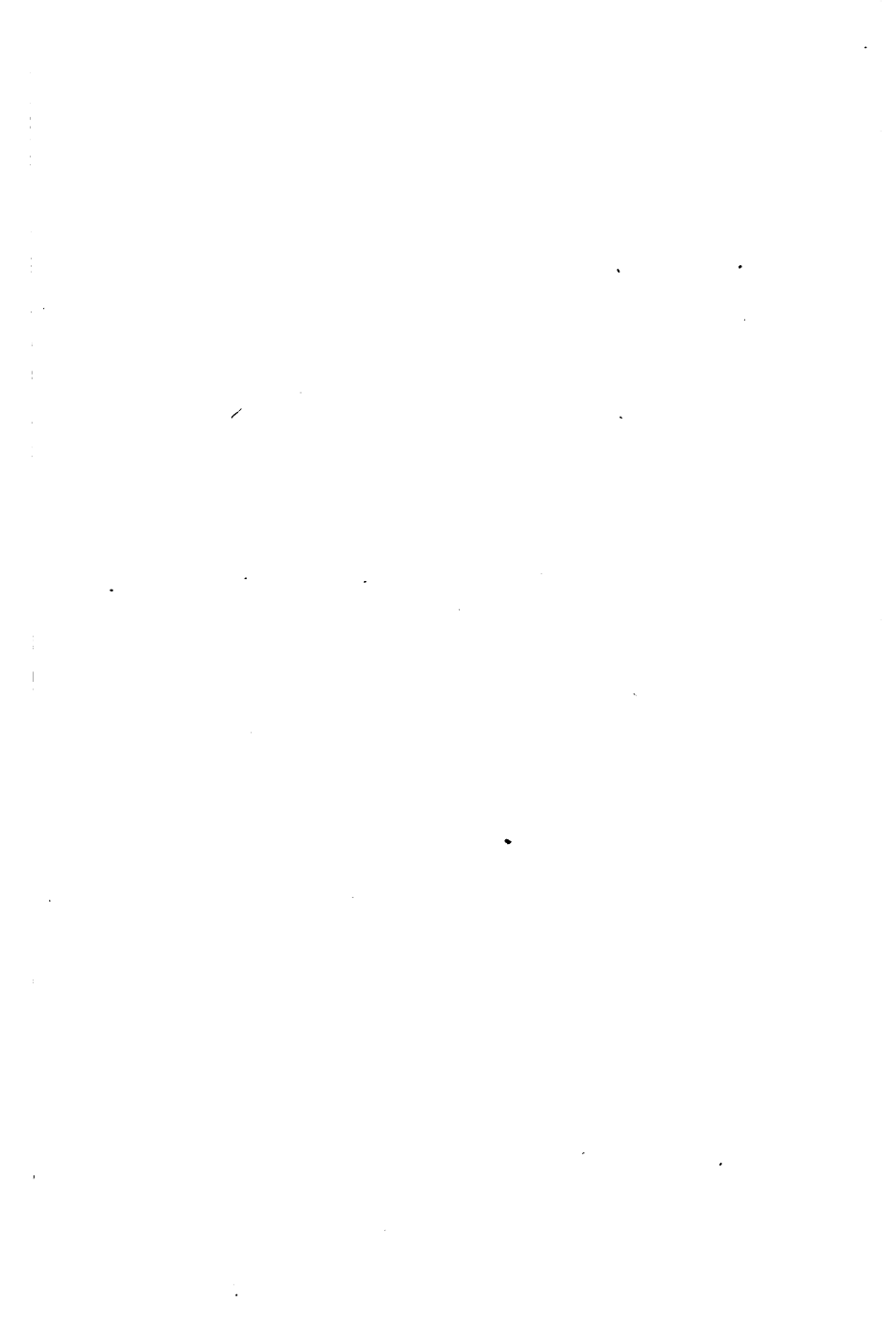
And this is how we know that most parts of this story are true.

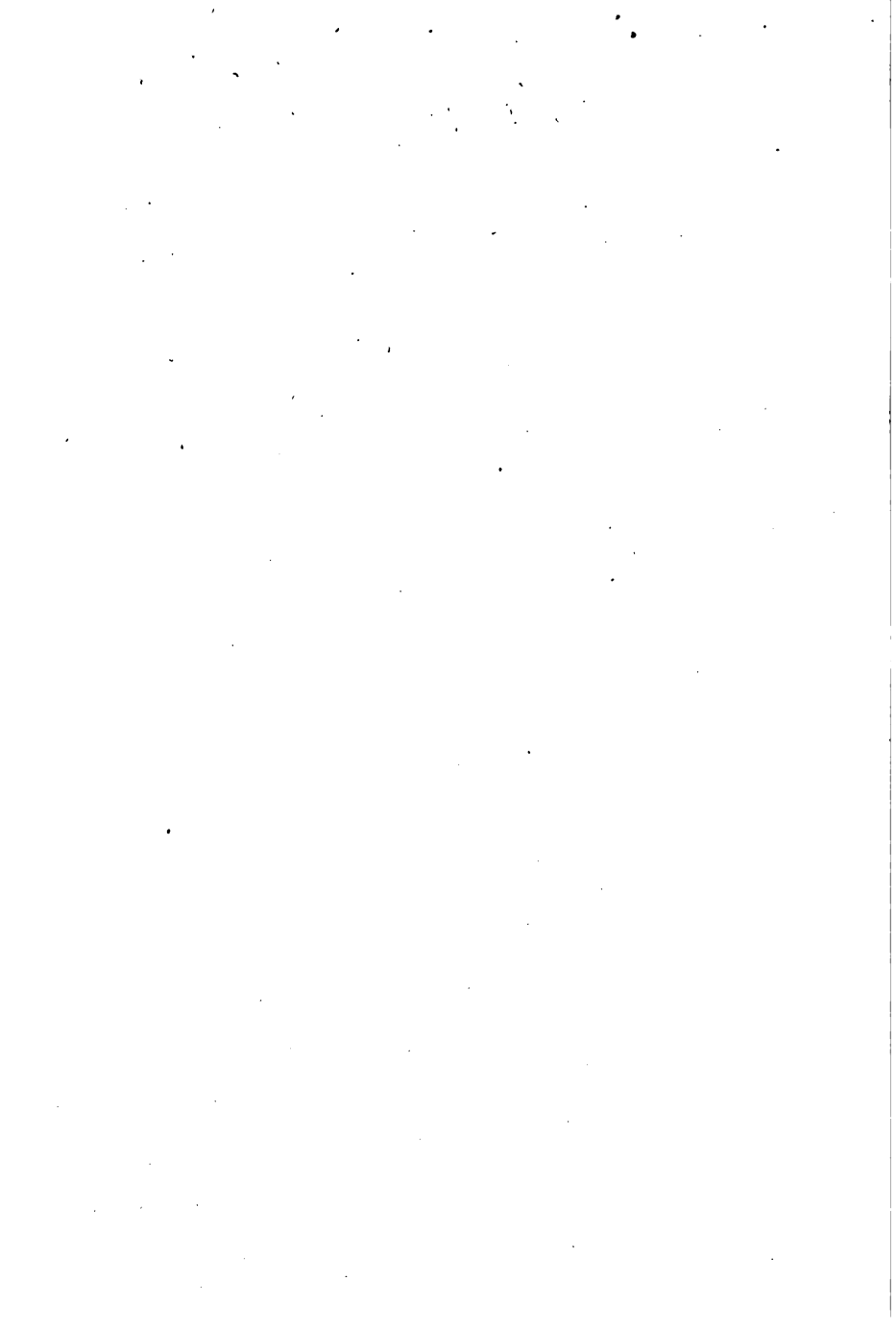
. . . . .

(Note to Reader: If you like this story and would like to know more about these first men, get "The Story of Ab," by Stanley Waterloo, from the library and read it.)

THE END







This book should be returned to the Library on or before the last date stamped below.

A fine of five cents a day is incurred by retaining it beyond the specified time.

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